OCT 31 1941

ENGINEERING AND MINING JOURNAL

OCTOBER, 1941

Sacking tungsten concentrates at the Wolf Tongue mill, Nederland, Colorado

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Georgia Inventories Its Mineral Wealth
Chile's Manganese Resources • Ore Occurrence at Iron King Mine
Operations at Canadian Johns-Manville Asbestos Mine, Part II
Mather Mine Dedicated • New Gold Dredge for Colorado
Milling Baker Mountain Kyanite • Floating Fluorspar
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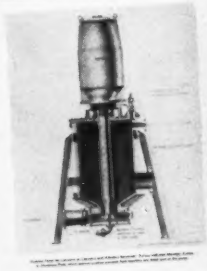

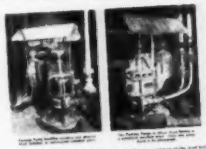

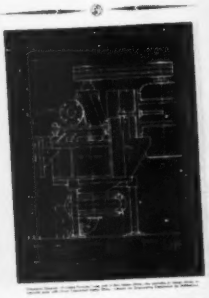

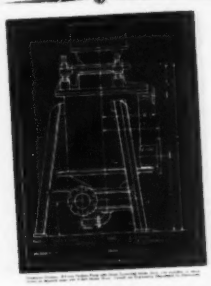

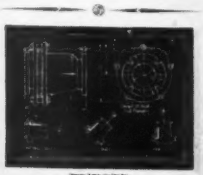

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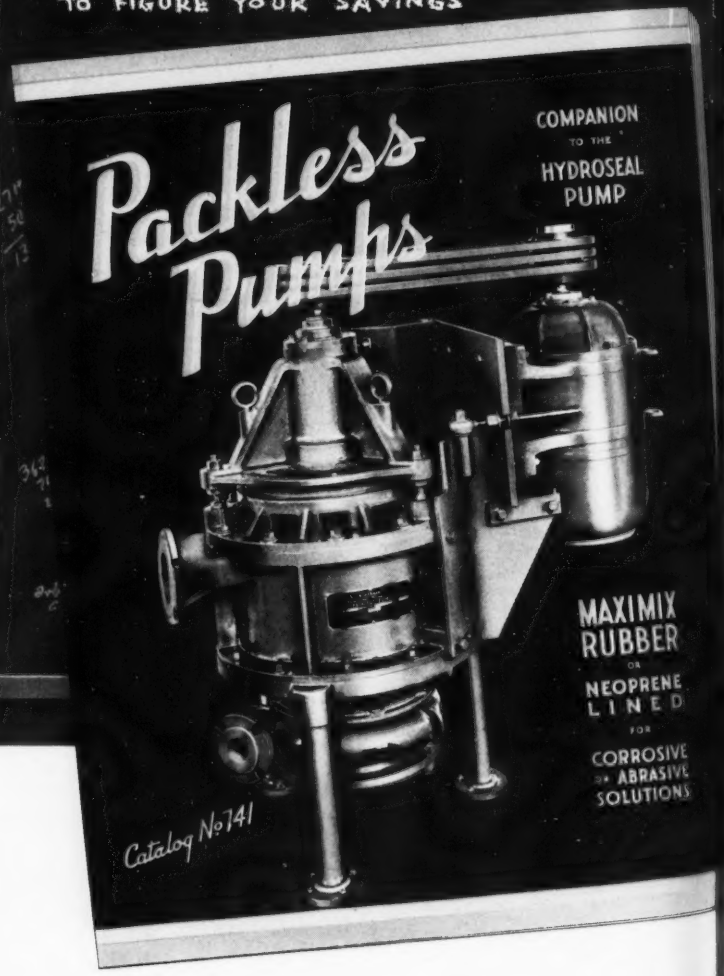
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Small-mine operators will be interested in the enterprise of Callahan Zinc-Lead Co. near Duquesne, Ariz., where lead, zinc, and copper concentrates respectively are being produced in a 150-ton mill, 20 miles from railroad. John B. Huttl visited this area recently. His account will appear next month.

▼

Non-metallic minerals of varied sort are abundant in the Southern States and the exploitation of such deposits is a feature of Southern mining. *E.&M.J.* in the coming months will present articles by staff members and company officials on different phases of these operations. J. H. Edwards, electrical editor, will deal with the electrical equipment of the Southern Phosphate Corporation in the November issue. Non-metallics are not confined to the South, of course. The November issue also will contain the third and concluding article by H. C. Chellson on the asbestos operations of the Canadian Johns-Manville company in Quebec.

▼

Also in the November issue: a very brief description of a method for estimating present worth of future operating profits whether the annual return is uniform or variable — by C. E. Mills, chief engineer for Phelps Dodge at Jerome . . . how noxious fumes are removed from the smoke after a blast in the Carlton tunnel by means of an activated charcoal filter devised by R. J. Owens, hygienist with Colorado's State Board of Health . . . hazards that arise in handling wire rope and how to avoid them — by F. L. Spangler . . . reducing costs through employee cooperation — by E. F. Rowe . . . automatic control of reagents in the flotation plant of Cuban-American Manganese Co., at Cristo, Cuba—by Frank Trotter, general superintendent . . . and several pages of the ever-popular "useful operating ideas."

H. C. PARMELEE
Editor

ENGINEERING AND MINING JOURNAL

H. W. CLARKE
Vice-President

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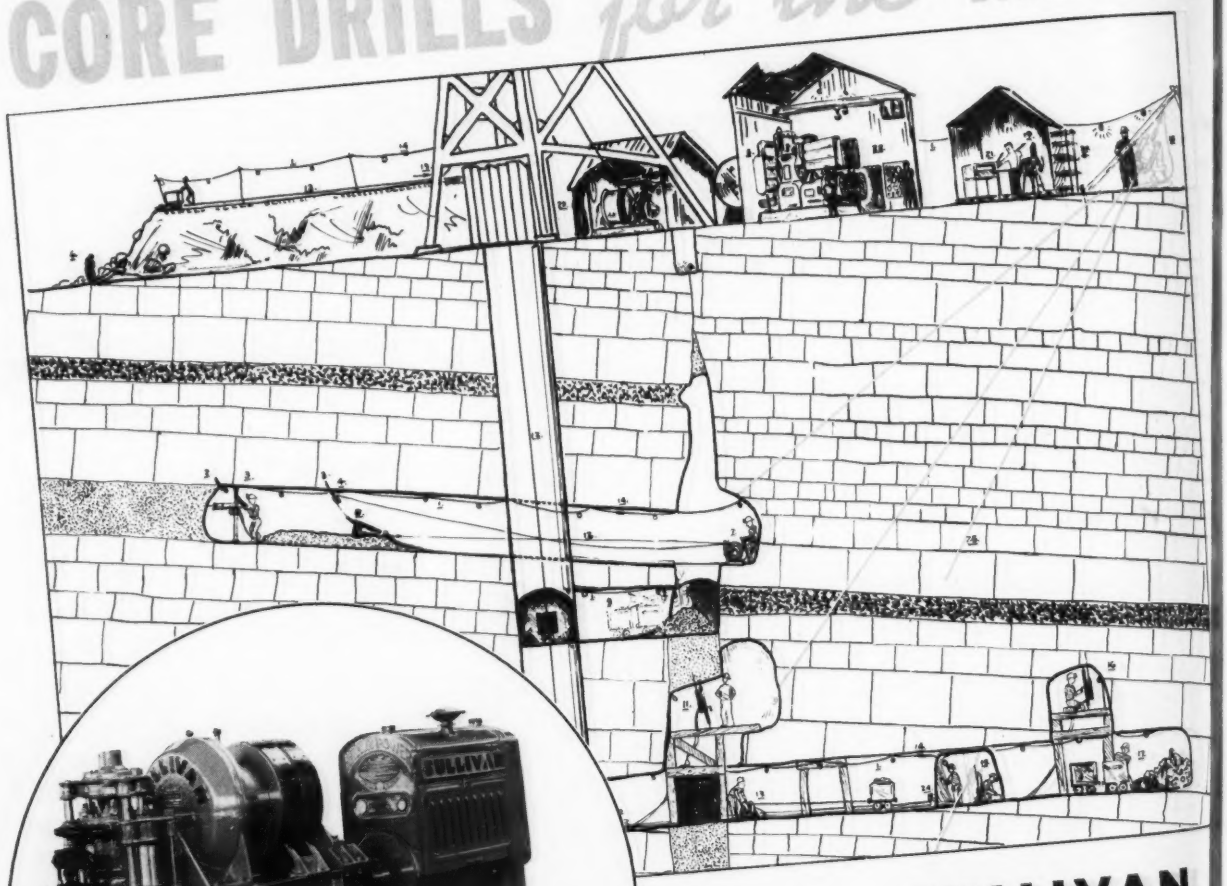

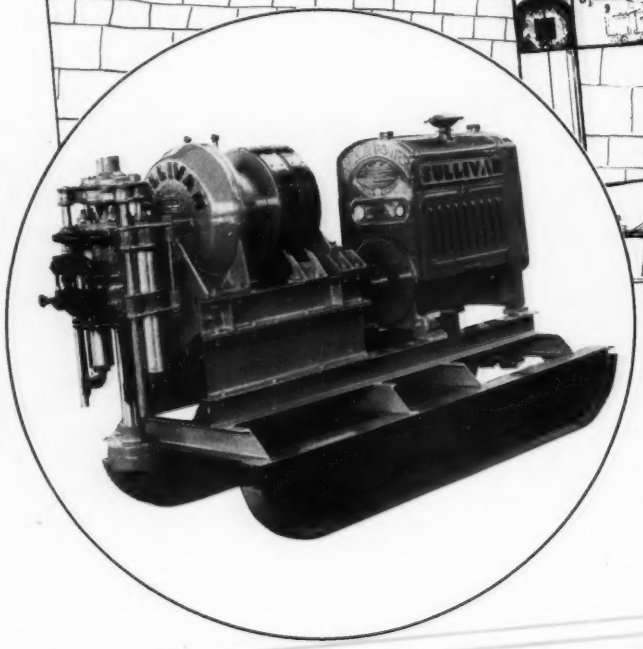

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Volume 142 OCTOBER, 1941 Number 10

Investments and International Good Will

RECENT ANNOUNCEMENT that the Export and Import Bank had loaned $20,000,000 toward erection of a steel plant in Brazil, an enterprise in which the Government of that country participates, may be interpreted in various ways, all spelling good will for the country under the Southern Cross. Further evidence of a friendliness for Latin America that goes beyond the mere desire to secure needed commodities is found in current news as to the accord just reached with Mexico, the terms providing for aid in stabilizing the peso and for a road-building loan of $30,000,000, as compared with Mexico's initial payment of $9,000,000 on account, arising from its oil expropriation in 1938. Facts such as these tend to encourage the would-be investor here who is seeking an outlet for his idle money. A staff writer of the *New York Times*, in citing the terms of the pending accord, said that they were "expected to provide increased reassurance to American capital which is now believed to be awaiting only the signing of the Washington accord to pour into Mexico." Here a word of caution is right and proper, a word in no wise unfriendly to our Southern neighbors.

Brazil is in truth a great and growing country, possessed of ample mineral wealth which is largely undeveloped, as was set forth in an editorial in the *E.&M.J.* of June, 1939. But, as was also pointed out on that occasion, there have been certain features of legislation in Brazil which were doubtless then acting and may still be acting as deterrents to new investment that might otherwise be made for mining purposes. In short, Brazil, bolstered by its Constitution and laws and with an able, patriotic Administrative head, has been determined to nationalize its natural resources, although as yet no definite time limit for such nationalization has been set. Report has it that affairs in this respect have recently taken a favorable trend and that certain legislation has either been passed or is pending, lightening the restrictions upon "American" participation in the Brazilian mining industry. However, caution is the word until something definite materializes. As matters have stood, up to the present, investments already made in that country's resources by citizens of the United States as well as the profits from such investments are likely to remain in Brazil, at least until some way is found to provide the dollars and to reimburse the investor.[1] Until this is done the investor must be prepared to follow his money if he wants to enjoy his dividends. Loans made by Washington, either for the purpose of stabilizing the country's economy, otherwise promoting friendliness, or developing supplies of needed commodities for the emergency, are quite another thing.

As for Mexico, *E.&M.J.* from time to time in the last five years has endeavored to picture truly for its readers what the American mining investor there was up against, and this without unfriendliness. Summarizing, the conditions during this period have been such that any investment of new money in the mining industry by private individual or company would have occasioned great surprise. If the conditions have changed basically, the fact is not apparent, even though altered economic conditions have had some chastening effect upon the radical element and much of the Mexican metal production is finding a market here instead of abroad. The future of private investment in Mexico still appears to be unsafe.

The good-neighbor policy merits every effort on both sides that will further it. It would be unfortunate, however, were investors led into painful mistakes by the unwarranted optimism of the poorly informed. Such financial errors would only tend to breed unfriendliness.

[1] In *E.&M.J.*, Sept., 1939, Howland Bancroft, consulting engineer, of New York, proposed and explained in detail, a definite and apparently workable scheme to this end. United States citizens and corporations then had, he stated, over $3,000,000,000 in long-term investments in Latin America.

Under the Umbrella

IN PARTS OF THE ORIENT the umbrella is the emblem of officialdom, gradations in rank being cared for by using "multiple-deck" construction in designing this badge of office. Thus the "Lord of the six umbrellas." Parts of our own officialdom also, it seems, are betraying a leaning to umbrellas, in this case the umbrella of defense, and many are scrambling to get under it. Blessed is the bureau that can secure a defense rating for itself! The powers-that-be have ruled that it can then protect itself against raids on personnel. And this is not the

sole advantage. A defense rating bestows prestige. A defense agency, moreover, is more likely to prove permanent if things get hot, or to get a wanted appropriation. All of this is as it should be, provided the question of defense is actually involved. Claims to this end will bear the same scrutiny that they are receiving with respect to private industry.

Engineers and Defense

THE ENGINEERS' DEFENSE BOARD which has just been organized under the ægis of the six national engineering societies should be able to give valuable aid to Washington planners, once it gets down to work. Certainly it seems that a body thus officially representative of the profession in the United States can render useful service, if it will, even if it proposes to function solely as a clearing house for information. It can at least be depended upon for accuracy. Headed by Robert E. McConnell, mining engineer and recently chief of the Conservation Unit of the OPM, it will deal with "technical problems on shortages, substitutions, conservation, raw materials, production and reclamation in the nation-wide readjustment under the impact of the defense effort."

Among the questions that arise respecting the Board, foremost are, why is it so late in starting and how does it rate in Washington, where for months other engineers have been wrestling with similar problems? Will there be needless duplication? The late start may reasonably be charged to the supposition that the work being done in Washington made an effort of the sort unnecessary. If the Board has been set up by request to help the Washington officials, the request was sensible and should have been made before. In the ideal State, the engineering profession will be called upon collectively for such aid as it can give at the outset of a critical planning period instead of after a year or more.

Late though it be in respect to defense, the Board can atone for this by adding post-war planning to its agenda. Some thought may well be given the problems of the future, however obscure that may be just now.

Bigger and Better Estimates

DURING AUGUST the mills and foundries operating in this country shipped products that contained the record total of 140,000 tons of copper, based on an estimate by the authoritative American Bureau of Metal Statistics. In August of the previous year the quantity of fabricated products shipped by the same group was 89,000 tons. A break-down of the movement of copper products would make interesting reading and perhaps answer some moot questions and shed light on where all of the metal is going. Defense unquestionably is taking an enormous tonnage of copper, but hardly enough to raise consumption to the rate of 140,000 tons a month, the equivalent of 1,680,000 tons a year.

Soon after the August consumption figures were presented to the trade, the Office of Emergency Management, in a memorandum to editors, volunteered "comprehensive background information" on copper. The statistics presented by OEM make interesting reading and line up as follows, in tons:

Supply:	1941	1942
Domestic production	950,000	1,100,000
Imports (Latin America)	500,000	500,000
Other imports	100,000	100,000
Secondary copper	100,000	100,000
	1,650,000	1,800,000
Demand:		
All military	600,000	1,000,000
Essential civilian	400,000	400,000
Other civilian	880,000	1,170,000
	1,880,000	2,570,000

The indicated copper shortage for 1941 is 230,000 tons, and for 1942 the deficit will amount to 770,000 tons.

On first thought we were inclined to suppress the 1942 figures, believing that additional publicity would serve no good purpose and only add to the bewildered state of the copper industry. The memorandum, fortunately, points out that the figures given for total civilian demand are based on the theory of unrestricted consumption in accordance with the anticipated rise in national income.

The estimates on probable needs of all materials are reaching such proportions that it is little wonder if a mere consumer gets a little excited and lays away a few tons of this and that for the day when there will be not enough of anything for anybody.

Priorities and Speed-up

CREDIT WHERE CREDIT IS DUE, especially when it is a pleasure to bestow it. Winner of the blue ribbon for efficient performance in bringing some order out of a world of chaos goes to Donald M. Nelson as Director of Priorities. From the tale we infer that the mail was stacked in heaps and applications for preference ratings were piled waist deep. Industrial America was writing in to headquarters. The clerical force was staggered. Enter Director Nelson. One look and the ex-mail-order executive, used to mailing pieces by the million and getting them back as fast, devises a plan fitting the situation, brings in his trained personnel, and lo! the "bottleneck" was gone. Hereafter such inquiries from American business are to be answered in 48 hours. Bottlenecks simply must not be, except on bottles.

Reflections from Washington

"SHOOT FIRST" is the motto of more than the Navy. The President has evidently also instructed other defense activities not to wait until contingencies are on them before taking action. Thus, there has been a definite tightening up of administrative procedure throughout all of Washington.

Perhaps most spectacular, and very useful, has been the speed-up in priority actions, one of the first official moves made by Mr. Donald M. Nelson when he took over the priorities branch of OPM. Formerly delays up to three and four weeks were frequently occurring. Seldom were priorities granted under two weeks of application. All this accumulated mass of material was brought together in one place. Experts in business mail handling were brought on from Chicago, as a loan from Sears-Roebuck, the firm of which Mr. Nelson has been executive vice president. And the business methods certainly startled those accustomed to red-tape technic.

It is definitely promised that priority applications will have action normally in 48 hours. Rarely will three days elapse before decisions are rendered. Some of the other defense units are taking notice of the prestige in the Capital City, as well as the compliment from the country, which comes from this drastic speed-up. There is clear evidence of effort to imitate it.

Mine Priorities

THE DIFFICULTY of the mining industry described in last month's issue of *E.&M.J.* will, officials believe, be largely cleared by changes in authority for priority on emergency repair parts and materials. On Sept. 17 in preference rating order No. P-56 mine supplies required for emergency repair were given an extremely high rating of A-1-a. All other requirements of parts, supplies, and equipment needed only for inventory or stand-by usage now have a rating of A-8. The rating of A-3, formerly applicable, is no longer used for either emergency or inventory requirements.

Warning has been issued that mining companies must not use these priority rights either to build up excessive inventory of supplies and spare parts, or to classify as emergency those normal repairs which can be made more deliberately from inventory stock. False certification of need may be penalized very severely, and probably will be in case of flagrant abuse.

When a mine operator requires emergency rating, he should get his permission by telephone, telegram, or letter from the priority coordinator for mines. Such authorization, usually by telegram, permits subsequent emergency purchasing without further formality. Suppliers of materials and parts are, however, generally expected to require written confirmation of transactions, so that

By Special Correspondent

the certification of the emergency by the mine operator will be a matter of record subject to later review if desired by officials.

Copper Shortage

THE FOLLOWING DATA are the basis of OPM's official calculation of 1942 operations with copper: Total supply of 1,800,000 short tons will, it is expected, come from domestic production, 1,100,000 tons; Latin-American imports, 500,000 tons; other imports, 100,000 tons; and secondary metal, 100,000 tons. Estimated requirements are for military needs, 1,000,000 tons; essential civilian business, 400,000 tons; other civilian orders, 1,170,000 tons. Thus, the total need of 2,570,000 tons indicates a shortage of 770,000 tons even if the most optimistic estimates of total supply are realized.

Federal subsidy for high-cost producers was arranged in August for three Michigan firms, but late in September, negotiations had not been completed. Further subsidy developments on both copper and zinc are generally forecast, but not officially announced up to late September. The original scheme of giving a production bonus above prevailing official price ceiling to any individual producer who can demonstrate the necessity for this will apparently be followed. However, serious legal complications develop as individual company negotiations are undertaken. It is hoped, however, that after a few typical cases are worked out there may be less difficulty in applying to many more firms the broad principles thus developed.

Forecasting Demand

A COMPREHENSIVE SURVEY of total United States requirements for industrial materials is being undertaken by the Supply Priorities and Allocation Board. Under the guidance of Donald M. Nelson, executive director, effort will be made to determine details and totals of civilian and military requirement, including the time schedules for procurement of Army, Navy, Air Force, and other items, and including, also, lend-lease supplies. Equal emphasis is being placed on the total quantity of material required over a period, and on the time or rate at which the requirement will reach the market. The timing of various demands so as not to conflict, as well as a scaling down of wants, may, therefore, be possible.

As this project is handled by SPAB, there appears to be in the making a long-range comprehensive survey which will subsequently be used for the guidance of *all* subsidiary defense units. Hitherto so-called "official" estimates of both supply and need were frequently in conflict with each other. Oftentimes two divisions of a single agency did not agree. Rarely did different bureaus or agencies reach similar conclusions. The result has often made cooperation of industry practically impossible. When the new superboard findings have been reached it is asserted that they will be governing on the actions of the various divisions of OPM and the military departments.

Priority Bootlegging

WASHINGTON claims positive evidence of bootlegging of metals and minerals, as well as other industrial materials which escape priority restrictions. Publication of many details regarding an alleged case of this sort with respect to zinc, described in one of the Washington newspapers during September, stirred prompt official action.

It was claimed that certain dealers were selling zinc at a normal price to those having priority ratings, but were charging much more, often double, to those who could not secure such preference classification for their purchases. Officials promise both searching investigation and vigorous punitive action where this practice can be proved.

Perhaps more common has been the type of pricing charged against certain chemical brokers, among others. Firms of this sort, generally companies organized within the last year, are believed to be taking goods from the normal channels of trade and selling them surreptitiously for high prices. Some firms have apparently been getting their supplies from unwitting manufacturers who thought they were selling the goods in the primary market to those doing defense business.

The Department of Justice is on the trail of this type of price manipulation, even in cases where priority rulings are not applicable. A clear case for prosecution may be found where price ceilings have been fixed by OPA, or its predecessor OPACS.

Why Estimates Grow

MANY AND LARGE INCREASES in the military requirements are announced at short intervals. This has led to much questioning in Washington regarding the way in which Army, OPM, and other official groups are doing their planning. Much criticism has been directed against those in charge "for not knowing what it's all about."

The mining industry has been as much or more affected by constant shifting of estimates than any other division of American business. Even before any metal group is able to adjust its plans to one schedule of requirements, a new and larger one has been imposed. The resulting turmoil in thinking and planning for individual enterprise has been serious; but apparently the cause has

been simple and the official apologies appear generally accepted as adequate.

There are several contemporary and interlocking causes for all this:

1. In the first place, the magnitude of the American effort is being constantly increased by increase in the anticipated number of men for our own armed forces.

2. The share of the supply service for European battlefronts assumed by the United States has been constantly growing both in magnitude and in percentage of the total job.

3. The sudden development of Oriental complications during the summer of 1941 added entirely new supply problems.

4. Ratio of equipment to manpower for any given force in the field has increased as the intensity of fighting has been developed by new German technics.

5. New types of fighting equipment have imposed entirely new metal and mineral burdens on the industry; for example, the stupendous increase in magnesium requirement as a result of extensive use of incendiary bombs.

6. And finally, probably most importantly, is the disposition of official Washington glibly to increase plans, often without regard to the full consequences.

The last item is one which certain industrial leaders have lately sharply criticized. It is no state secret in Washington that some types of planning have gone so far that expanding programs actually slow things down instead of speed them up. The program for steel utilization is perhaps the most conspicuous example. The more high priorities granted for this structural metal for new defense plants the less effective are plans for delivery on old projects. Hence, hundreds of plants are "slowed down to a walk" because too many are started at once.

Many months ago it was pointed out in these columns that some of the metals would probably form the ultimate bottleneck in military operations. That forecast is now being realized. It is quite evident that the availability of brass will be limited next year so severely as to make it questionable whether all of the munition plants can function when complete, even if substantially every nonessential civilian use for copper and zinc is cut off. This situation gives great importance to the recent official estimates of copper supply and requirement for 1942.

Nickel From Brazil

A PRELIMINARY REPORT was made of nickel occurrence in Central Brazil in the Bureau of Mines Foreign Minerals Quarterly dated July, 1941. That rather noncommital report, written some time before publication, has since been supplemented by a much more encouraging report to the Bureau. It was made by C. W. Wright and his mining engineering associates in cooperation with officials of the Brazilian Government after personal investigation of this nickel occurrence.

As a result of this more recent report, active commercial investigation, with some prospect of early development, is being carried out by certain American firms. Copies of the report, which is stirring new optimism, may be consulted by representatives of responsible American companies at the Bureau of Mines. It is not contemplated, however, that this report will be published in the near future.

In the past, some of the major obstacles to development of Brazilian minerals have been requirements of the mining law of that country. Ownership of mining enterprise has been limited to firms predominately of Brazilian nationality. Operation by outside enterprise has been encouraged; but exchange restrictions have usually prevented taking more than 30 percent of the profits out of the country, The rest of the profits could be utilized for further development, additional machinery, or for other spending within Brazil.

Recently important amendments of the mining regulations have been adopted. It is hoped that this will remove some of the more serious obstacles to participation by United States capital in Brazilian mining.

News "Fines"

Enforcing Priorities—A tightening up on priority rules is being diligently organized to include control of Army and Navy buying, as well as private hoarding. Bootlegging of materials has been much worse in fact than has been reported in the press, it appears. Some form of prompt punitive action must be developed during October, officials believe.

"Grade B" Tin—OPM now defines as Grade B all pig tin which assays 99.8 percent but contains impurities above the tolerances permitted for Grade A. Officials insist that the trade must not class this metal higher merely to get the higher permissible price. Price ceiling for Grade A is 52c., but Grade B sells at a discount of ¾ of a cent. A modified schedule of differentials for sales of tin in small lots was announced Sept. 19. Prices above the normal quantity ceiling of 52c. range from 1c. to 3c. for lots below five gross tons.

Mine Ropes—Full priority control governs the import and use of manila fiber and manila cordage and rope. Three classes are recognized, with the requirement that Class A and Class B cordage may be prepared only for sale or delivery to certain specified users. Mining firms may purchase this high-grade rope under this priority order "for use for hoisting and transmission of power." For other applications even the mining industry must use Class C cordage.

Plenty of Chromium—Surprising variation in the supply of scarce metals has been discovered as the defense program developed. Some of the materials which were expected to be most scarce are proving relatively more abundant than others. For example, a recent comment in these columns develops the criticism that chromium is nothing like as scarce as was implied by earlier comment. There appears to be no shortage whatever of chromium for any purpose having a priority rating of A and a sufficient supply is available for many, even most, of the B class priorities.

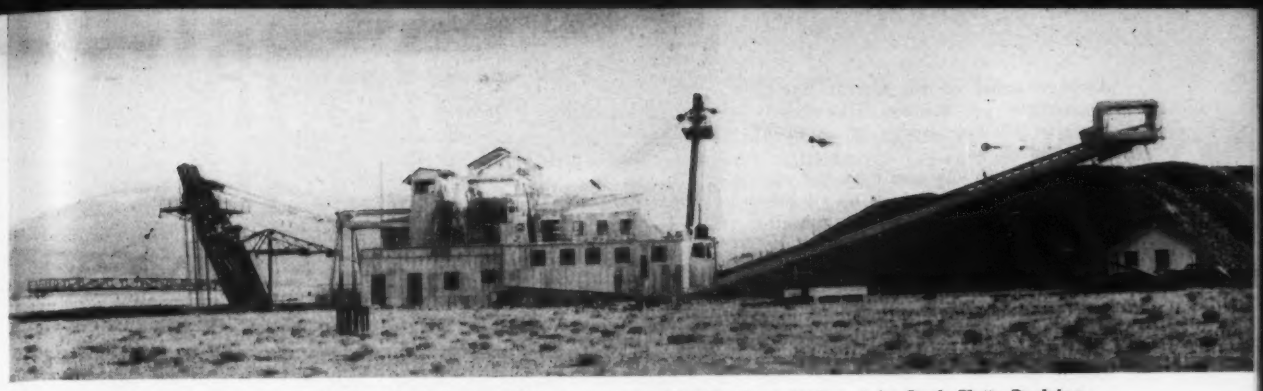
Strategics Are Taxed—Despite a vigorous effort of the Washington spokesmen of the mining industry, Congress finally decided to withdraw the exemption from strategic minerals which had previously protected them against certain excess-profits taxes. Those special mining operations are now to be taxed just as other mining enterprise.

Allocations, Not Priorities—A new philosophy of control of scarce metals is developing. The idea is that the priority program is not adequate. A new program of allocation of materials is being developed to take its place. Apparently the new scheme would arrange for specific orders to be given to each producer of a regulated material, determining just where he would send his output. In other words, the distinction is that the regulation is applied by orders to the producer, not permits to the purchaser. How and when this will work out is not clear at the end of September.

No Import Duty—Congress is giving sympathetic attention to a new proposal for eliminating the duty on certain strategic and critical materials. The latest plan, which appears to have considerable support in Congress, would not be as broad as that earlier proposed. It would permit import without tariff only of those strategic and critical materials brought into the United States by defense corporations working under RFC control. Furthermore, a time limit of July 1, 1943, is proposed. This form of legislation meets most objections to the blanket repeal of duties earlier considered. It does not answer the criticism that the whole thing is merely a bookkeeping transaction and repeal is intended merely to permit RFC to do more business than Congress expects with a given sum of money.

Buying From Soviet—In mid-September a plan for aid to Russia was formulated through an RFC contract. By this arrangement the Soviet business enterprise in the United States, Amtorg Trading Corp., will supply to Defense Supplies Corp. approximately $100,000,000 of manganese, chromite, asbestos, and platinum, and perhaps a few other minerals. An immediate advance of 10 percent is given and the advances will be increased up to half of the delivered value without waiting for any of the purchased material to be brought to the United States.

Lead Under Priorities—All supplies of lead, including domestic and imported metal, were placed under full priority Oct. 4. The new control over this metal is provided in General Preference Order M-38, which sets up an allocation system. Main points in the order are: 1, Refiners and dealers in lead must file with the Director of Priorities not later than the 20th day of each month a schedule of proposed shipments for the following months. 2, After Oct. 1, when specified, each refiner must set aside from his production in a special pool a quantity of lead to be fixed from time to time; the lead in this special pool will be allocated directly by the Director of Priorities to meet emergency situations. 3, In shipping the balance of his production not covered by the pool, each refiner must give preference to defense orders as required by Priorities Regulation No. 1. 4, All lead released by the Metals Reserve Company will be allocated by the Director of Priorities.



Operating about two miles south of Fairplay, Park County, Colo., is this new 11-cu.ft. placer dredge of the South Platte Dredging Company; Mount Silverheel is seen in left background

Colorado Attracts Another Large Bucket-Line Dredge

New production from area near Fairplay will add materially to State's position as a producer of placer gold

H. W. C. Prommel
Consulting Geologist and Mining Engineer
Denver, Colo.

THE VALUE of placer gold produced in Colorado has steadily climbed from its all-time low of $21,568 during 1931, to $693,665 in 1939. There was a slight reduction in value to $647,600 in 1940, but during 1941 and 1942 the value of placer gold produced in Colorado may exceed one million and two million dollars, respectively. This rapid increase is due in part to the construction and operation of new large dredges of the dragline and close-connected bucket types, three of which will enter production in Colorado during 1941.

The largest, fastest, close-connected bucket-type dredge that has ever operated in Colorado was completed and started operations during June 1941. It was built by the South Platte Dredging Company, and is being operated in the valley of the South Platte River, near Fairplay, Park County, Colo. The Natomas Company, of California, owns one-half interest in the South Platte Dredging Company. Jefferson J. Dolittle, of La Grange, Calif., is president of the company. R. W. Derby, Jr., is manager and A. E. Dinkelman is resident superintendent at Fairplay. The main office of the South Platte company is at Mills Tower, San Francisco.

Construction of this dredge was preceded by a careful sampling campaign in 1939 and 1940. Testing was done with a placer drill. The dredge pond, 275x300 ft. in size and 15 ft. deep, was completed during the fall of 1940, after which assembly of the hull commenced. About 100 men were employed during the construction period. Three or four men operate the dredge on each shift.

The dredge, including hull and decks, is of steel construction, and wood has been used only for sidewall housing. The weight of the dredge, fully equipped, is 2,400 tons. All equipment and machinery, a total of 2,524.4 tons, were hauled by trucks from the railroad points of Salida and Buena Vista, distances of 56 and 35 miles respectively. The Gately Motor Company, of Alma, Park County, Colo., did all hauling and dug the dredge pond.

Attempts will be made to operate the dredge throughout the year. The dredge is electrically operated by equipment manufactured by the General Electric Company. Power is furnished by the Public Service Company of Colorado and amounts to 1,500 hp. connected load. An average of 1,150 hp. are used.

The hull, which houses some of the equipment, measures 54½x158 ft. The digging ladder, which can dig 70 ft. below water level, measures 139 ft. from tumbler to tumbler and consists of 103 11-cu.ft. buckets weighing 3,300 lb. each, or a total of 165 tons. They are equipped with Taylor-Wharton interchangeable manganese-steel lips. The diameter of the tumbler shafts at the center is 20 in.

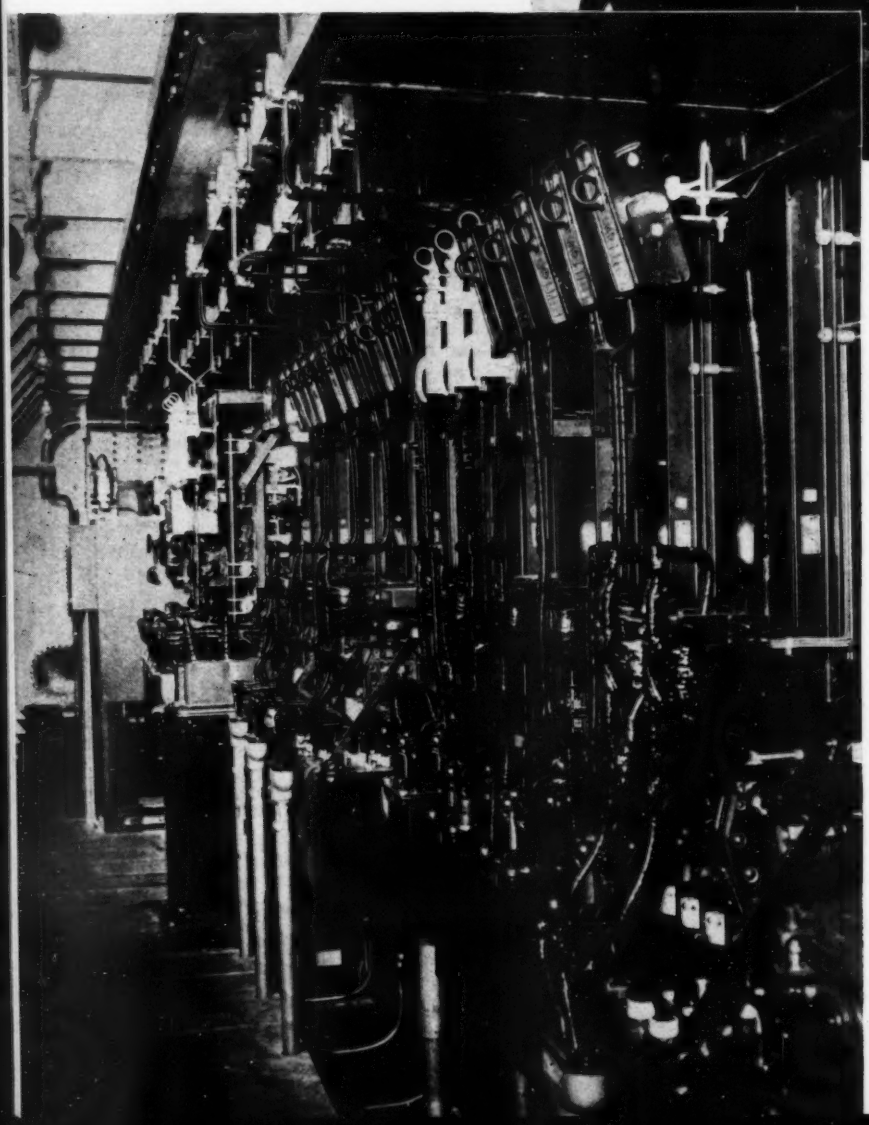
Power for the bucket line is furnished by two 187½ hp. d.c. air-cooled motors situated on each side of the upper tumbler and connected to it by Farrell-Birmingham gear drives. Ward Leonard system of controls is used on the bucket line and swing winches. The placer is 10,000 ft. above sea level. An 800-hp. synchronous motor drives the d.c. generators, which also furnish d.c. current for the bucket line and swing winches. When in reverse position, or paying out cable, each swing winch also generates power. The motor and generators are located in the hull of the dredge. All motors are air cooled. Removable square fiber glass filter units are set in a small structure located on the upper deck of the dredge directly behind the control room.

The rated capacity of the dredge is 17,000 cu.yd. per day, but it has already exceeded that digging speed.

Average speed of the bucket line is 36 buckets per minute. The yearly capacity of the dredge is rated at 5,000,000 cu.yd.

The winch room straddles the digging ladder, with windows on all sides and on each floor, and the operator has a clear view at all times of digging ladder, spud, and stacker-discharge end, as well as swing winches and bucket-line hoist winch. Two electric controls, one on each side of the winchman, operate the swing winches. Facing him, to the left, is a 24-hr. indicator dial chart which records the depth at which the ladder is digging at any time during the day. Other indicators to his right show the speed (number of buckets per minute) at which the dredge is operating, as well as amperages of main drive and port and starboard winches. The stern winch controls and indicators are also in the winch room to the right of the operator. Frictions and brakes of winches are operated by Westinghouse air control.

The over-all length of the trommel is 50 ft. and it is 9 ft. in diameter.



Main a.c. switch gear control installation on the dredge

Two master switches, one on each side of the dredge operator, control the swing winches. To the left of the operator is a 24-hr. indicator dial chart which records the depth at which the ladder is digging at any time

Distance between tires is 41 ft. Screen plates are $\frac{7}{8}$ in. thick, with tapered holes $\frac{1}{4}$ in. to $\frac{3}{8}$ in. at upper end, $\frac{3}{8}$ to $\frac{1}{2}$ in. in center, and $\frac{1}{2}$ to $\frac{5}{8}$ in. at lower end of screen. The screen makes $6\frac{1}{2}$ revolutions per minute. Washing in the screen is done by means of a spray pipe extending the full length of the screen.

Stacker Is 165 ft. Long

The oversize from the screen can be discharged entirely onto the stacker belt or entirely through a rock chute at the stern of the boat making the 42-ton spud more secure. A hand-operated lever controls the oversize discharge from the screen. The stacker, center to center of pulleys, is 165 ft. long and operates at an inclination of 17 to 22 deg. The stacker belt, 42 in. wide, is a Boston Woven Hose & Rubber Company Bulldog-type ribbed belt.

Two 14-in. and one 8-in. motor-driven Kimball-Krogh pumps furnish water on the dredge. One additional auxiliary 14-in. Kimball-Krogh ad-

justable pump can be used for either high- or low-pressure water delivery, as desired.

Jigs Are Used

The recovered gold is comparatively fine. Both gold-saving tables and Bendelari single-cell jigs are therefore used under the screen. From the distributor box the fines travel over short amalgam traps and distributor launders, arranged to control the flow of water and fines over each jig, to eight 42x42-in. Bendelari jigs on each side of the boat. The overflow from the jigs passes onto transverse gold-saving tables (where more water is added) with Hungarian riffles, into two streamdowns on each side of the dredge. The hutch material from these rougher jigs, which contains over 90 percent of the gold saved on the dredge, passes over riffled and screened gold tables, from which most of the gold is recovered during clean-ups. The tailings from these tables discharge into an elevator and thence over a Bendelari cleaner jig; the overflow is discharged into the streamdowns, and the hutch material empties into a 2x3-ft. diameter Straub ball mill, from which it is delivered into riffled and screened sluice boxes discharging at the stern of the boat. This flowsheet is used on each side of the dredge. Besides the jigs, there are over 3,000 sq.ft. of gold-saving table area. The tables have a slope of 1¼ in. to the foot. Clean-ups are made once weekly.

The dredge is electrically lighted throughout and carries a large floodlight atop the winchroom. In case of power shut-downs a 5-kva, a.c. 115-volt Kohler light plant is used to light the dredge. The winch room is heated by a 8,000-watt electric heater.

A boiler-heating plant located in the bow of the hull furnishes steam heat. Some circulating heaters will also be installed. Fuel oil is used in the heating plant.

The dredge is equipped with a number of Cyclops cranes, electrically operated, of various sizes and dimensions. A 20-ton traveling crane is arranged transversely over the upper tumbler of the digging ladder and two smaller cranes are located at each side of the digging ladder at the bow.

Clear mountain water is fed into the dredge pond by a ditch several miles in length, from Sacramento Creek, a tributary of the South Platte River. The overflow from the dredge pond empties into an old dredge pond about 1,000 ft. from the present location of the dredge. It then filters through a large stretch of old dredge tailings before reaching the South Platte River, which supplies Denver's water reservoir system. The pollution question is solved very simply in this way.

This dredge, now operating successfully in Colorado, is the latest in modern dredge construction and handles a larger amount of gravel than older dredges of similar size. The operation of this dredge, as well as of the large dragline unit now being assembled on the Snowstorm placer in Park County, will again call attention to Colorado as a placer gold producing State which is now approaching a greater yearly production of placer gold than it has achieved during any year since 1868, a period of 73 years.

Reaching to a depth 70 ft. below water level, the 103 eleven-cu.ft. buckets on the digging ladder convey gold-bearing gravel to the trommel screen for washing. All buckets are equipped with interchangeable manganese-steel lips

Chile's Manganese Resources

Rehabilitation of the industry will make available to the Western Hemisphere substantial tonnages of ore formerly sold to Germany and Japan

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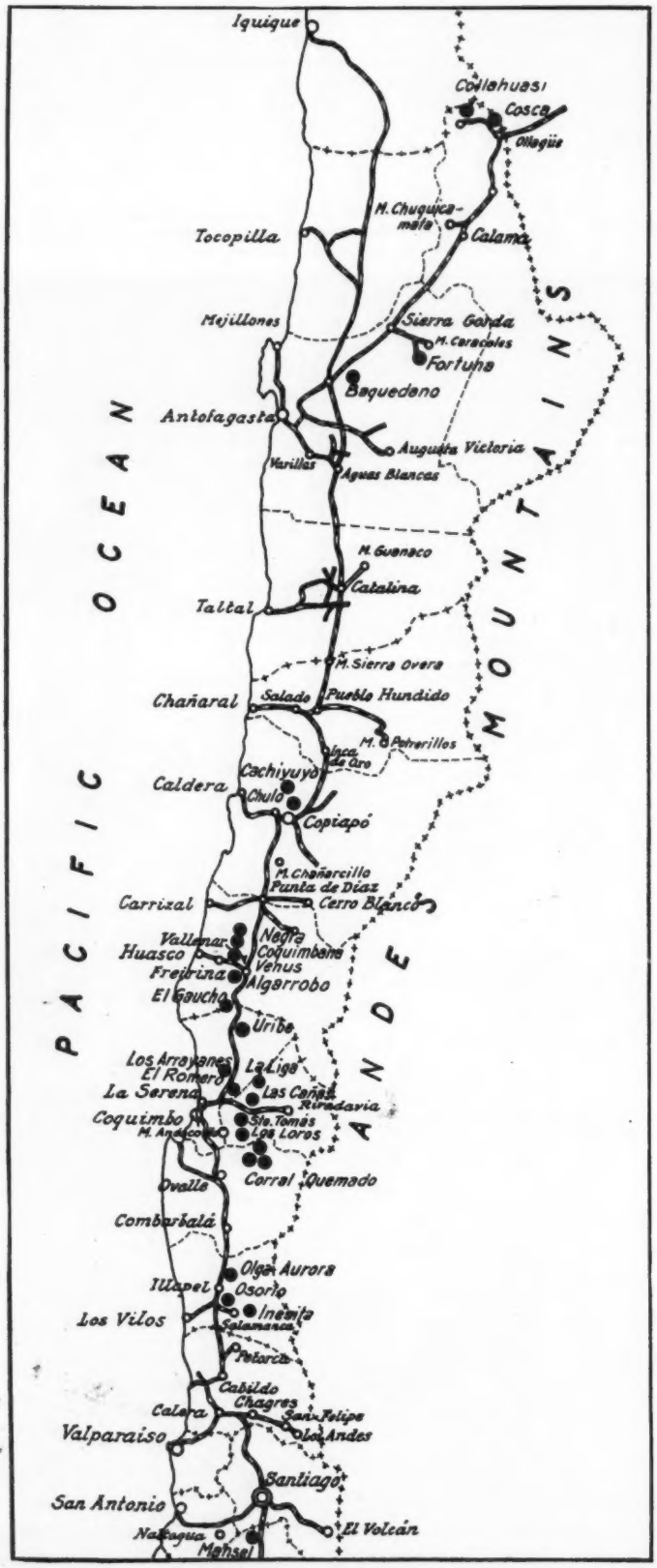


Fig. 1 . . . Map of Northern Chile showing occurrence of manganese deposits. Approximate scale 1:6,000,000

WAR has again drawn attention to the importance of manganese as a strategic mineral and to the possibility of the United States being supplied with all the manganese ore it requires for its rearmament program from domestic supplies and other sources in the Western Hemisphere. This article is a contribution to a better understanding of Chile's manganese ore reserves, which in the past have yielded appreciable tonnages to the world's requirements of this metal.

From 1885 to 1905 Chile produced 550,000 tons of high-grade manganese ore, which was exported mainly to the United States. Maximum production was reached in 1892, when over 50,000 tons was exported.

At the beginning of the present century Chilean ores had to meet the severe competition of Indian, Brazilian, African, and Russian ores, and production practically ceased. However, 1937 saw a revival of manganese mining and 13,000 tons was exploited, most of which went to Germany. In the period 1929-1937, average production reached only 4,000 tons per year.

There are two well-known belts of manganese mineralization in the coun-

try. The first is situated between the ports of Huasco and Carrizal, in the Province of Atacama, along the Coast Range of mountains which extends from Antofagasta in the north to Puerto Montt in the south. This range consists mainly of very ancient crystalline rocks such as schists, gneisses, and granites overlain by Cretaceous and Tertiary marine sediments.

The manganese ores in the northern zone of this belt occur in beds of from less than a foot to five feet in thickness and have a general strike north-south, dipping from the vertical to 60 deg. east. From a single bed to three parallel beds are found lying close together but separated from each other by a few feet of chert and dark-red jasper. In places these beds are continuous for several miles. The manganese ore seams occur interbedded mainly with other beds of chert and limestone of grayish color. Occasional sills of green basic rocks intrude into the sediments. The ore is a hard and black psilomelane with conchoidal fracture, containing in parts considerable black chert.

The southern end of the belt is much shorter in extent and the manganese beds occurring in it are nothing like so continuous as those in the northern portion. Four parallel beds strike N.E.-S.W. and dip 45 deg. N.W. Only the two lower beds have been mined to any considerable extent. The country rocks are much the same as those in the northern zone. The ore is a hard, black braunite mixed with smaller amounts of psilomelane and wad.

The principal mines in the Carrizal district were opened in 1886 by an English syndicate and worked continuously until the beginning of the present century. Since then they have been idle.

The second zone of manganese mineralization extends 40 miles from about the northeast of Ovalle to directly east of La Serena in a north-south direction in the Province of Coquimbo. All the mines are found in the first spurs of the Andes range at an elevation of from 2,000 to 3,500 ft. The country is rough and barren, though not so devoid of vegetation as the Carrizal district. Agriculture is plentiful in the narrow valleys and canyons of this province.

This belt is not all ore-bearing but is broken up by barren zones. Within it are found the distinct districts of Corral Quemado, Arrayan, La Ligua, Las Cañas, and Marqueza. The rocks consist of volcanic flows with which are interbedded sandstones, shales, conglomerates, and limestones of Cretaceous and Jurassic age. The manganese ore beds conform closely to the stratification of the sedimentary rocks and the ore is closely allied to the limestones. There are from one to three ore-bearing beds, and they occur close together. Their thickness varies between 1 to 3 ft. and they are, as a rule, much flatter than those in the Carrizal district, having an average dip of 20 to 30 deg. The ore is a blue to black, granular to crystalline pyrolusite, fairly soft.

The Principal Mines—Within the Coquimbo manganese belt are the Romero mines, in what is locally known as the Marquesa district and situated due east of La Serena, some 37 miles by road from this town. They are only 8 miles from the station of Marquesa on the branch railroad from La Serena to Rivadavia. Their elevation above sea level ranges from 3,000 to 3,300 ft.

In this mine the orebody consists of two manganese beds which outcrop in a small gulch in the hills on the north side of the Elqui Valley. The strike of the beds is N. 25 deg. E. and their dip is from 20 to 25 deg. W. The orebody has been developed by a series of tunnels along the outcrop over a horizontal distance of 1,000 ft. and some 650 ft. on the dip.

Both beds are worked, the lower being the more important, its thickness ranging between 1 and 3 ft. In this bed the ore is fairly compact and homogeneous. The upper bed is thinner, never more than 12 in. thick, but the grade of the ore is higher. The two beds are separated by a parting of fairly hard clay, 3 to 5 ft. thick.

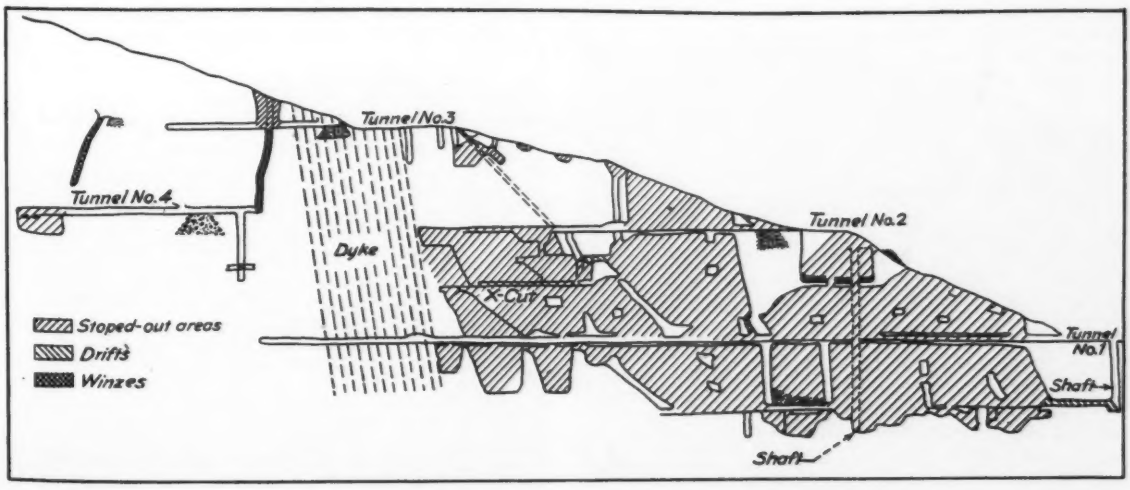
Ore is found in the form of lenses which extend for some hundreds of square feet and which thin down along the edges to 10 to 12 in. The lower bed rests on porphyry and the upper bed is overlain by sandstone and conglomerate. The horizontal extent of these manganese beds is considerable, and although they are not workable along their whole length, they appear to be the same beds that are exploited in the Las Cañas mines, to the southeast.

The chief minerals, in the order of their importance, are psilomelane, manganite, pyrolusite, and polianite.

Romero mines have been opened by drifting along the lower bed at different elevations and on a slight grade for haulage. Track gage is 24 in. and half-cubic-meter (17½-cu.ft.) dump cars are used. This system of development by drifts or tunnels following the strike of the beds makes the levels very tortuous but keeps the track near the breast stopes from which the ore is mined. A few pillars are left, but the main support is waste filling, which is hand packed. The haulage tunnels are connected by winzes for ventilation which have an inclined length of 200 ft.

Production of these mines has ranged from 400 to 600 metric tons per month. The grade of the ore is

Fig. 2 . . . Longitudinal section, Coquimbana mine, Carrizal



kept as near 48 percent Mn as possible. Impurities amount to 10 percent silica, 0.06 percent phosphorus, and 0.05 percent copper.

One hundred men are employed, 80 underground in mining and hand picking the ore and 20 on the surface.

The ore is paid for on the basis of metric tons delivered by the contractors ready for export at the surface. Consequently, the man who does the actual mining also does the hand picking. This is the system of payment most prevalent in small mines in Chile. About one-third of a ton is the average output per man-shift.

Ore reserves of this mine can be estimated at 30,000 tons containing 48 percent Mn. The ore as taken out of the mine averages between 36 percent and 44 percent Mn. At the surface it is cobbed and sorted so that the grade is raised to as near 48 percent Mn as possible.

These same manganese ore beds are being developed from the south side of the hill along a new section called the Yeso mine.

Sufficient water for concentration purposes can be obtained from the Elqui River. The ore could be transported to water by means of an aerial ropeway 3.7 miles in length.

The Romero mines belong to Grace & Co., of New York, and have been exploited for many years.

Cocinera Mine—Cocinera is the most important producing mine of the Corral Quemado district, which falls within the southern or Coquimbo manganese belt. The mine itself is 16 miles southeast of the town of Andacollo, where the most famous gold placers of Chile are located.

In this district a manganese ore bed outcrops for a considerable distance having a general strike N. 30 deg W. and a dip of 60 deg. S.W. Towards the southeast this bed has been faulted and the two exposed portions are called the Videla and Lucero beds. To the northwest, which is probably the same bed, it is called the Guillermina.

Most likely these various manganese beds, known locally as the Guillermina, Cocinera, Videla, and Lucero, are but parts of a single orebody which practically covers the large "estancia" or ranch of Corral Quemado. Erosion has weathered considerable areas of this bed, which to the west of the Cocinera mine is known by the names of Manto Gray and Loma Negra.

The Cocinera orebody, which has an average thickness of 16 in., is found near the base of a sandstone series some 30 ft. thick. The sandstone rests on a red tuff and is overlain by an andesitic tuff. Probably the orebody is due to a metasomatic replacement of the sandstone by oxides of manganese carried in ascending hydrothermal solutions. The predominating mineral is pyrolusite, but some braunite is also found.

The mines were first exploited as far back as 1885 by a British syndicate which worked them until 1902. They were reopened again in 1918 and have been exploited continuously since then with varying degrees of intensity.

The mode of entry is by a series of tunnels and inclines driven in the manganese beds from the outcrops. No systematic mining is carried on and a considerable portion of the ore is carried out to flat plats on the surface, where it is cobbed and hand picked to export grade (46 percent Mn) in the manner prevalent in South America.

The Cocinera mine has produced in the past 1,000 metric tons of ore per month for considerable periods of time, but in the last few months production has reached only 800 tons a month. Before the present war all of this ore was shipped to Germany. As the known reserves of this mine are near depletion, a new development program is being carried out both to the north and to the south of the Cocinera mine, in what are known as the Videla and Lucero beds. The grade of the ore as mined assays over 40 percent Mn and about 8 percent SiO_2, 0.07 percent P, and 0.30 percent Cu. The sorted ore is trucked 35 miles to the station of Andacollo on the Longitudinal railroad at a cost of $2.20 U.S. currency per ton and the railroad takes it to the port of Coquimbo, a distance of 19 miles, at a cost of $0.40 U.S. per ton.

Water for concentration purposes can be found in ample quantities in the river Hurtado at a distance of some 13 miles. From here the concentrates would have to be trucked 16 miles to the Recoleta station, on the Longitudinal railroad, for shipment to the port of Coquimbo.

Manto Gray—This orebody lies to the northwest of the Cocinera mine and all the geological evidence points to the fact that the Manto Gray, Loma Negra, and Cocinera mines are all the same ore bed. The related rocks are very similar to those at the Cocinera, the only difference being that in Manto Gray the bed is much wider—over 3 ft.

This mine has been opened by a tunnel 250 ft. in length run along the bed, from which a series of drifts and winzes have been driven.

As mined, the grade of the ore is 45 percent Mn over the whole of the orebody. As the mineral contained is very friable pyrolusite, a simple screening operation on fixed inclined screens can raise the grade of this ore to over 47 percent Mn. The oversize is thrown on the dump with nearly 40 percent Mn.

Until the outbreak of the present war, all the production of this mine was shipped to Germany, where, in spite of its large proportion of fines, it found a ready market. It is said that in Germany an appreciable tonnage of ferromanganese is made in electric furnaces in which a large

Table I—Variations in Mining Costs

	Lowest Cost Mine U.S. $ per Metric Ton	Highest Cost Mine U.S. $ per Metric Ton
Exploitation	$2.40	$2.80
Cobbing and hand picking	0.40	0.60
Trucking to railroad	1.00	3.40
Railroad freight to port	0.52	0.40
Development	0.80	0.60
General expenses	1.00	0.80
Total cost at port	$6.12	$8.60

Table II—Reserves of Manganese Ore

Name of Mine	Tons
Fortuna	30,000
Chulo	5,000
Cachiyuyo de Llampo	3,000
Coquimbana	100,000
La Negra	45,000
San Antuco	5,000
Bandera de Chile	10,000
Romero	70,000
Los Loros	3,000
Cocinera	30,000
Total	301,000

Table III—Comparison of American and Japanese Schedules for Manganese Ore

	American Schedule	Japanese Schedule
Minimum grade	46 percent Mn	42 percent Mn
Delivery	f.o.b. Chilean port	f.o.b. Chilean port
Price	U.S. $0.245 per unit	$0.26 U.S. per unit
	Payment in dollars	Payment in Chilean pesos dollars changed into pesos at the rate of 33 to the dollar
Moisture	.....	2½ percent
Allowable impurities:		
Silica	12% SiO_2 + Al_2O_3	12% SiO_2
Iron	up to 7%	Minimum 1%
Phosphorus	up to 0.15%	up to 0.25%
Copper	up to 0.03%	up to 0.15%
Lime	.....	10%
CO_2	.....	3½%
Fines	up to 12½% (20 mesh)	30% (20 mesh)
Zinc	1%	.....
Size	up to 4"	up to 4"
Penalties:		
Silica	Price reduced 1½¢ per unit for each 1% in excess of 12%	
Phosphorus	Price reduced 10¢ per unit for each 0.1% in excess of 0.25%	

percentage of fines is no hindrance to the metallurgical process; whereas in the United States ferromanganese is manufactured in blast furnaces in which the percentage of fines has to be kept low. Since the outbreak of hostilities, this mine has been idle, as there is no market for this particular ore, with its very high proportion of fines. Ore *in situ* assays 40 to 45 percent Mn, 6 to 7 percent SiO_2, 0.04 percent P, and 0.15 percent Cu.

Were it possible to find a cheap and satisfactory method of briqueting, agglomerating, or sintering this ore, appreciable tonnages could be mined for export to the United States, as it is evident that the mine has a large tonnage of probable ore. The bed is over 3 ft. wide, and mining is cheap on account of the softness of the material.

Loma Negra—Located southwest of Manto Gray and to the west of the Cocinera mine, is the Loma Negra orebody. The occurrence of manganese within the standstone series is exactly the same as in the Cocinera and Manto Gray mines, previously described. However, replacement in the sandstone by hydrothermal ascending solutions has been far less complete than in the other two mines and, consequently, the grade of this orebody reaches only 30 percent Mn; but the width is much greater—6½ ft. No ore has yet been taken out of this mine, as it is impossible to raise its grade to comply with export requirements by the only concentrating process available in these mines, that of cobbing and hand picking.

Considering the fact that the overburden is very light in Manto Gray and the width is quite appreciable for a manganese orebody, this mine could be cheaply worked by open-cut methods. However, until an efficient and cheap method of concentrating is found, the mine will have only a potential commercial value.

Channel samples of Manto Gray assay 30 percent Mn, 2 percent SiO_2, 24.4 percent CaO, 0.04 percent P, and 0.10 percent Cu. It is estimated that this mine contains half a million tons of ore running nearly 30 percent Mn.

Coquimbana mine—The Coquimbana is at the southern end of the northern manganese belt of Chile, in what is locally known as the Carrizal manganese camp. Geographically it is in the Province of Atacama, 29 miles north of the town of Vallenar, at an altitude of 1,900 ft. This mine and other mines of the Carrizal district were developed and worked intensively from about 1888 till 1902 by a British company known as the Chilean Manganese Co. A sharp decline in the price of the metal is the reason given for the English syndicate abandoning this and several other manganese mines which it possessed in Chile.

At that time the ore was shipped by a 10-mile spur to the Canto del Agua station, on the Carrizal-Cerro Blanco railroad, which ran to the small port of Carrizal. Since the abandonment of the mines the rails of the spur have been taken up, but the right-of-way could be made into a truck road. The Carrizal-Cerro Blanco railroad has been ceded by the Government to the Caja de Credito Minero (Chile's Mining Loan Bank) and will soon be opened to traffic.

The ore from this mine can be taken by truck to the Freirina station on the Huasco-Vallenar railroad, a distance of some 22 miles, at a cost of $2.10 U.S. per ton. The distance from Freirina to the port of Huasco is 10 miles and total freight on the railroad costs $0.24 U.S. per ton to this port.

The Coquimbana, like most of the manganese mines of Chile, is located in a hilly and desert country where it seldom rains. In appearance the land is very similar to that of Nevada, Utah, and Arizona, as some of the photographs show, and the climate is just as healthful and pleasant.

The outcrop of this manganese bed, a part of which has been exploited at the Coquimbana mine, can be followed in a north-south direction for nearly 6 miles, though of course its grade does not make it possible to exploit it at all points. At the Coquimbana mine, the bed has been tilted almost vertically, its dip being 85 deg. to the east. The predominating mineral is a very hard and dense psilomelane containing considerable iron and silica in a calcitic gangue. There are several minor faults almost perpendicular to the strike of the bed which throw the orebody to one side of the drifts along the strike. The mine was opened by three tunnels driven in the bed from the outcrop, the vertical interval between tunnels being 165 ft. The longest of the three tunnels, which is also the lowest, is 1,200 ft.

As the longitudinal section shows, Fig. 2, the mine has been worked out down to the level of the bottom of the main shaft. Since it was abandoned the mine has filled with rain water to the level of the lowest tunnel and observation shows that all the blocked-out ore was mined except that left as supporting pillars. This is without doubt the principal manganese deposit so far worked in Chile if width and grade are considered. Some of the old stopes show widths of 12 ft. and over.

Recently a company has been formed to work some of the mines in the Carrizal camp, and the Corporacion de Fomento has advanced it a loan of $28,000 U.S. to reopen and

Surface workings of the Bruja mine

Surface stopes of the Negra mine

equip the mines. It is planned to invest this capital as follows: In unwatering the mines, $1,000; in development, $6,000; construction of a camp, $2,400; machinery and materials, $16,000; total, $25,400.

Other mines along the Carrizal belt are the Huasquina, Porvenir, Negra, Venus, and Bruja, but as their characteristics are so similar to the Coquimbana, to give a description of each would be superfluous.

Sufficient water for concentrating the ores of the Carrizal district could probably be found by sinking shafts at a locality known as Chorrillos, 15 miles to the north of the Coquimbana mine and 3 miles south of the Canto del Agua railroad station.

Location and Size of Deposits—As can be seen from the map and as the description shows, the manganese deposits of Chile are favorably situated, as all of them are near the coast; and the Serena-Rivadavia, Carrizal-Cerro Blanco, or Huasco-Vallenar transverse railroads pass within reasonable distance of them. However, so far as size and grade of the ores are concerned, Chile's deposits cannot be compared with those of Russia, India, the Gold Coast, or even Brazil.

Ore freight on the State railroads is very low, about 2½ American cents per ton-mile. Trucking, on the contrary, is quite expensive. This is mostly done in Ford and Chevrolet trucks of 3 metric tons' capacity, as the roads do not allow of heavier loads and trucks. Gasolene costs 33 American cents a gallon (import duty is 15 American cents a gallon) and ore trucking cannot be done at less than 10 American cents per metric ton-mile if amortization of the truck is allowed for. Amortization is high on account of the bad roads in most of the mining districts.

Ore loading facilities at most Chilean ports are poor and costs consequently high—$1.20 per metric ton. The ore has to be loaded into lighters at the piers and then transferred to the ships. A notable exception is the Cruz Grande harbor, belonging to the Bethlehem Chile Iron Mine Co., where 22,000 tons of iron ore is put aboard the company's ships within an 8-hr. shift.

Mining costs, freight to the railroads and to port, etc., vary from mine to mine in the Coquimbo belt. Lowest and highest cost mines are given in Table I.

The high cost of mining (in which is included breaking ground, mucking, and tramming) is due to the fact that at most mines between 2 and 3 tons of ore *in situ* must be mined to obtain 1 ton of export ore of 46 percent Mn.

Reserves of Manganese Ore—According to a recent report by B. Leiding, of the Departamento de Minas y Petróleo (Chilean Bureau of Mines), the present reserves of export ore of a grade approximating 35 percent Mn are shown in Table II. As all of these ores will have to be sorted to raise them to 46 percent Mn demanded by the exporters, the tonnage will probably be reduced to 100,000 tons. According to the same author, the reserves of "possible" concentrating ore amount to some 1,200 tons of 30 percent Mn distributed as follows: Coquimbana, Negra, and other neighboring mines, 100,000 tons; Las Cañas, 500,000; Manto Gray, 100,000; Loma Negra, 500,000; total 1,200,000. To this tonnage could be added some 200,000 tons of the low-grade material that would result from the sorting of the 300,000 tons of 35 percent grade ore.

Possibility of Concentration

Success attained by the Cuban American Manganese Co., a subsidiary of Freeport Sulphur Co., in concentrating its low-grade manganese ores in the Oriente Province of Cuba by jigging and flotation, has drawn attention in Chile to the possibility of applying the same methods of beneficiation to the local ores. However, the large amounts of water required and the heavy expenditure incurred before complete success was obtained, have somewhat dampened the early enthusiasm which the first news of this really notable technical achievement raised in Chile. Thanks to the interest shown in the development of Chile's manganese deposits by C. W. Wright, foreign mineral specialist of the U. S. Bureau of Mines attached to Foreign Service, Department of State, three representative samples of manganese ores from the Carrizal, Corral Quemado, and Marquesa camps have recently been shipped to the United States to be tested by the new sink-and-float process. The results of these tests are awaited in Chile with considerable interest.

Ore-Buying Schedules—Until quite recently, the only markets open to Chilean manganese ores were the American and German. Before the outbreak of the present war, local producers were able to export their products to Germany, an outlet that was favorable to some ores on account of their high percentage of fines, as was the case with the Manto Gray.

Within the last two months, Japanese buyers have begun competing for local ores under terms which are more favorable than any thus far offered. The buying is carried out by Japanese merchants, who in their turn import into Chile appreciable amounts of Japanese merchandise, principally cotton goods. The whole system is based on barter and payment is made in Chilean money. These ores are shipped to Japan in Japanese ships, just the same as the copper ores and concentrates which they have been buying in this country for years.

Table III gives a comparison of the two schedules under which manganese ores are bought in Chile, and will bring out some striking differences between them.

If the characteristics of Chilean manganese ores are considered, the advantages offered by the Japanese schedule are evident as regards the lower grade of ore accepted, the latitude allowed in the much greater proportion of fines (30 against 12½ percent); and a greater copper and phosphorus content before these deleterious impurities are penalized.

Considering a 46 percent ore, the price per ton f.o.b. Chilean port obtained by the miner is respectively $11.27 and $11.96 U. S., with the American and the Japanese schedules, but since in the first case the dollars will have to be exchanged into Chilean pesos at the official export rate of 25 pesos to the dollar, and in the second case the resulting "dollars" are changed into pesos at 33, the values received by the seller in the country's currency are respectively 281.75 and 394.58 pesos, an advantage of 112.93 pesos per ton in favor of the Japanese schedule. Put in another way, in order to make the difference clear to the American mind unaccustomed to the complexity of the different rates of exchange prevalent in Chile for the same foreign currency, if the ton-value of a 46 percent ore in Chilean pesos according to the Japanese schedule is again turned into dollars at the official export rate of exchange (25 to the dollar), the price value of the ton that could be applied to imports would be 15.80 dollars and the price per unit 0.343 dollars.

When the local miner considers that the present price of 46 to 48 percent foreign manganese ore per long ton unit c.i.f. U. S. ports is today between 51 and 52 cents, he asks why he is paid almost exactly half that price. He forgets that today one ton f.o.b. Chilean port and one ton c.i.f. U. S. ports accounts for the difference rather closely.

The author has drawn freely from Harder's[1] article on the manganese deposits of Chile with regard to their geology, as well as on a recent and very complete report on the mines by B. Leiding, of the Departamento de Minas y Petróleo de Chile.

Under present conditions of price and with the help of the Corporación de Fomento a la Produccion (an organization similar to the American Reconstruction Finance Corporation) and the Caja de Credito Minero (Mining Loan Bank of Chile), it is possible that the country might reach a production of 40,000 tons a year of 46 percent manganese ore.

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[1] Harder, E. C.: Manganese Ores of Russia, India, Brazil and Chile. *Trans.* A.I.M.E., Vol. LBI, 1917, pp. 31-76.

The Mather Mine

A new show place for the Iron Country

Surface plant, headframe, and shaft will have features of striking interest

A. H. Hubbell
Associate Editor

WITHIN THE CITY LIMITS of Ishpeming, on the Marquette iron range, in the Northern Peninsula of Michigan, the Negaunee Mine Co. is engaged in opening a mine on nearly a square mile of virgin ground which, when present plans have been carried into effect, will provide one of the show places of the Lake Superior Iron Country. The underground layout has been designed to yield an output of 1,600,000 tons of ore annually from a depth of 4,000 ft. The headframe, of steel, will be 197 ft. in height, probably the largest in the world. The surface plant also will be striking in its layout and construction. This mine was recently dedicated as the Mather mine, in honor of W. G. Mather, chairman of the board of the Cleveland-Cliffs Iron Co., which is a partner in the new enterprise.

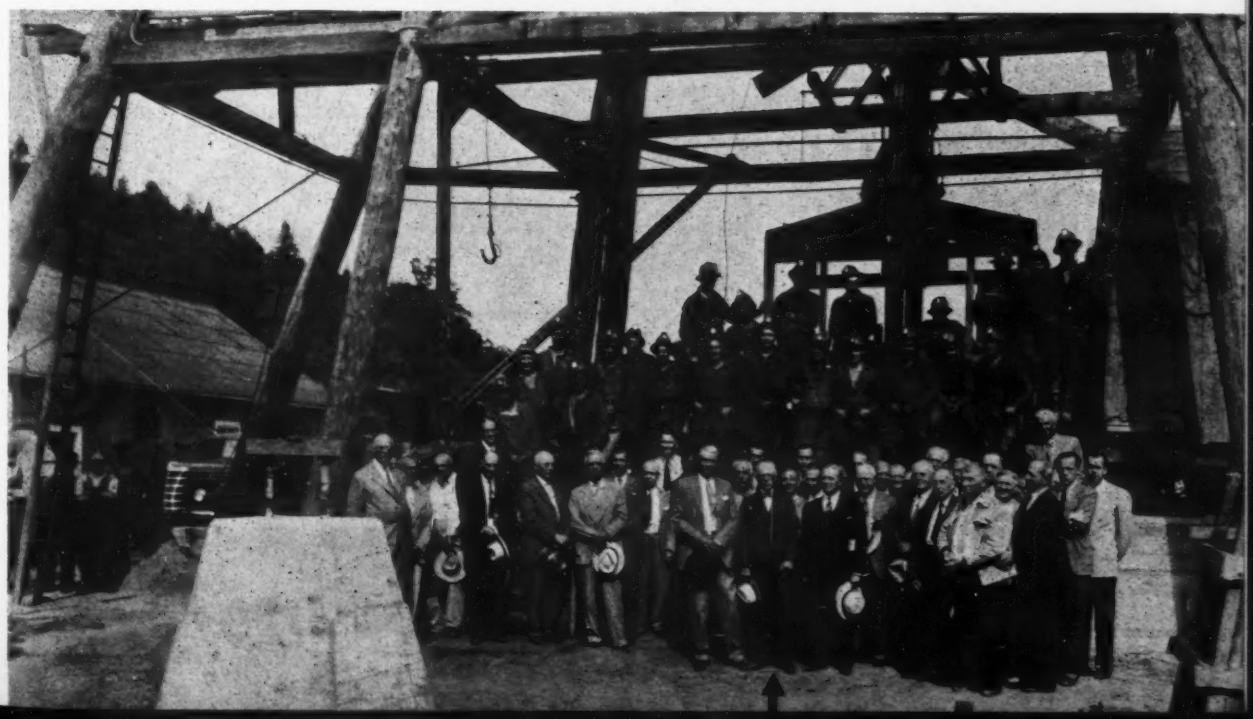
The property constitutes all of Section 2, T.47 N., R.27W., except a 20-acre strip in the N.E. ¼ which is under lease to outside interests. With this exception, the section has been leased from the Cleveland-Cliffs company by the Negaunee Mine Co., a partnership organized by Cleveland-Cliffs and Bethlehem Steel Co. for the purpose of equipping the property. Cleveland-Cliffs will be in charge of operation. This arrangement gives assurance of a customer for its ore to Cleveland-Cliffs and of an ore supply to Bethlehem. S. R. Elliott, of Ishpeming, has long been manager of Cleveland-Cliffs. C. W. Allen is superintendent of the Mather mine, in charge of operations.

Ground was broken for the plant buildings at the end of September, 1940, and construction was well toward completion late in August when this was written. The shaft, which is vertical, was collared on Jan. 6 last and was 530 ft. deep at the time of writing, despite various delays. It is to be sunk to 2,900-ft. depth before the work is stopped and will subsequently be deepened to 4,000 ft. The hoists will be capable of working to 5,000 ft., though at somewhat less capacity. Construction of the headframe will be under way before this article appears and would have started sooner had not the question of steel priorities been raised, with consequent delay before it was settled. The Worden-Allen Co. has the contract for the headframe and the Austin Co. that for the buildings. The accompanying drawing shows the surface layout.

Section 2 is on the Marquette synclinorium, which has an east-west trend. The iron formation on the property dips south. The south footwall cuts the surface 4 miles south, outside the property limits.

The shaft is approximately 15x20 ft. in dimensions in the rock and will be timbered for its entire depth with steel sets on 7-ft. centers, with steel studdles between. These sets are being put in as sinking progresses. There are four compartments, including two skipways, each 5 ft. 9 in. by 6 ft. inside the steel members; one cage compartment 6 ft. 6 in. by 12 ft.; and a

This group gathered at the shaft beneath the sinking headframe on the occasion, early in August, 1941, of the dedication of the Mather mine, so named in honor of W. G. Mather, chairman of the board of the Cleveland-Cliffs Iron Co. The arrow in the center indicates Mr. Mather. On his left is E. B. Greene, president of the company. At his right stands S. R. Elliott, long manager of Cleveland-Cliffs. Photo by Childs Art Gallery, Ishpeming



The new plant that is to serve the Mather mine, as it appeared under construction in August. This should be compared with the accompanying drawing. In the right background is the town of Ishpeming. Photo by Childs Art Gallery, Ishpeming

3 ft. 11½ in. by 12-ft. compartment which is divided into two parts for a ladderway and a pipe-and-cable way respectively.

Sinking is under way with a four-post wooden headframe 58 ft. high and a 6 ft. diameter by 8 ft. Ottumwa electric hoist. It is being done on three 8-hr. shifts with a crew of 12 men per shift, including a so-called shaft leader. These men do all the work done in the shaft save that of three construction men who work day shift only.

The shaft round consists of approximately 72 holes, using a combination of a burn cut and V-cut. Drilling is done with 65-lb. hand-held jackhammers, consisting of six Cleveland H111W (wet) and six Ingersoll-Rand JB5 machines, and detachable bits. The latter are Jackbits. For fast drilling an effort is made to drill a hole of minimum diameter. A 2⅛-in. Sibley-type bit on a Type 1 thread is employed for starting. Three runs are made with this type of bit. A 1¾-in. Copper Country (alloy) bit on a Type O thread is then substituted and three runs are made. Average depth of hole is 6½ ft.

For blasting, Hercules Extra LF (low-freezing) gelatin dynamite 1¼x8 in. is used, in 90 and 80 percent strengths. The holes are shot with electric delays through a double-circuit blasting switch, which is then shorted and locked in the off position.

Mucking is done by shoveling into a 1-cu.yd. tray, which is dumped into a 2-cu.yd. (3.5 tons of broken rock) car on a cage over a steel chute built into the side of the cage. The tray is lifted by an air hoist having a 2,000-lb. rope pull (at 80-lb. air), at 175 f.p.m. This pull is doubled (with a 50 percent reduction in speed) by using a block. The hoist, an Ingersoll-Rand KUA unit, is on the bottom set protected by the stage set. The arrangement is like that developed for sinking the Newport mine at Ironwood[1], save that the tray in the latter case dumped into a skip instead of a car. About 65 cars are hoisted per round.

Air is supplied to the bottom of the shaft by a Ventair blower, size 6, Type T M, on a 5-hp. induction motor, through 14-in. diameter steel pipe which will be used later as the cage counterweight guide when sinking is completed.

The sets are of 25-lb., 6-in. H-beams and the studdles are 6x6x½-in. angles. These are made of Bethlehem's Mayari-R steel, which is credited with a corrosion resistance approximately six times that of ordinary steel. It contains 0.2 to 1.0 percent chromium, 0.25 to 0.75 percent nickel, and 0.5 to 0.7 percent copper.

To place a steel set in position the shaft men work from a plank-covered steel stage set hung 3 ft. below the position of the new set by means of four 1-ton chain blocks hung from the set above. This is followed either by pouring a concrete ring or by wedging with sacks of concrete, depending upon the set.

To line the sets a device invented by Captain T. A. Anderson has given satisfaction both as to speed and accuracy. It is shown in a photograph. It consists of a 12-in. diameter steel disk having a center hole and carrying a hand-operated reel of cord which runs downward through the hole to the plumb bob below. The disk hangs from three No. 9 American Coil chains joined at their upper ends to the suspending cord, which has a hook at the other end for slipping over a set. For alignment one of these disks is hung in each corner, the hook being slipped over the set immediately above the last concrete-ring set and the 12-in. disk resting more or less horizontally in the corner against the concreted steel set with the plumb bob hanging in the shaft below it. Even if the disk is not quite level, the center hole is practically 6 in. from both members of the set and the new set below can be brought into line by jacking until its members are 6 in. from the string in each corner. Mr. Allen avers that the alignment thus secured checks closely with the engineering department's plumb lines to the 500-ft. depth and that it takes but 10 to 15 minutes to line a set. The device is suspended from the same point until the two sets below the concrete-ring set and the next concrete-ring set have been placed in position. For the fourth set the hook is transferred to the set above the new concrete ring and the shaft crew follows the same procedure as before.

The concrete that supports those posts of the headframe that are immediately above the shaft serves also as the shaft lining to a point 90 ft. below the collar. This concrete was poured from the bottom upward. From the 90-ft. point down a complete concrete ring has been poured at every third set and the two sets between are wedged to the walls with sacks of concrete placed when wet. Two to four sacks are used at each corner of these sets and, where possible, one sack is used at the end of each long divider. At points where the wall slopes outwardly a sack is supported on a piece of steel inserted in a downward sloping hole drilled in the wall. Studdles are wedged with a concrete sack wherever the adjacent wall slopes inwardly, thereby affording a satisfactory point of support.

Distance between the shaft bottom

C. W. Allen, superintendent of the Mather mine

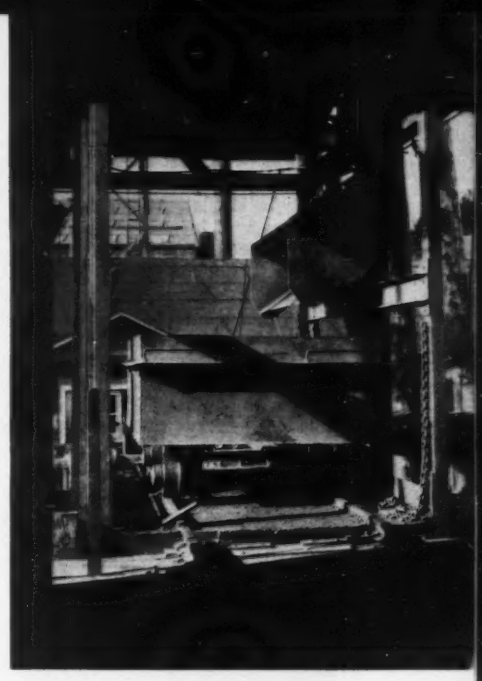
[1] "Shaft Sinking and Electrification at the Newport Mine." *E.&M.J.* Sept. 24, 1931, p. 213–216.

and the stage set has varied from 15 to 35 ft.

The sinking cycle is still in the experimental stage. Time spent on the various operations is approximately as follows: Drilling, 5 hr.; loading holes, hooking up, and blasting, 2½ hr., including delays on account of smoke; cleaning and trimming walls, ½ hr.; placing steel sets, 3½ hr.; concreting, 1½ hr. average per set; mucking, 13½ hr. for 130 cu.yd. Total 26½ hr. It is hoped that this can be brought down to 24 hr.

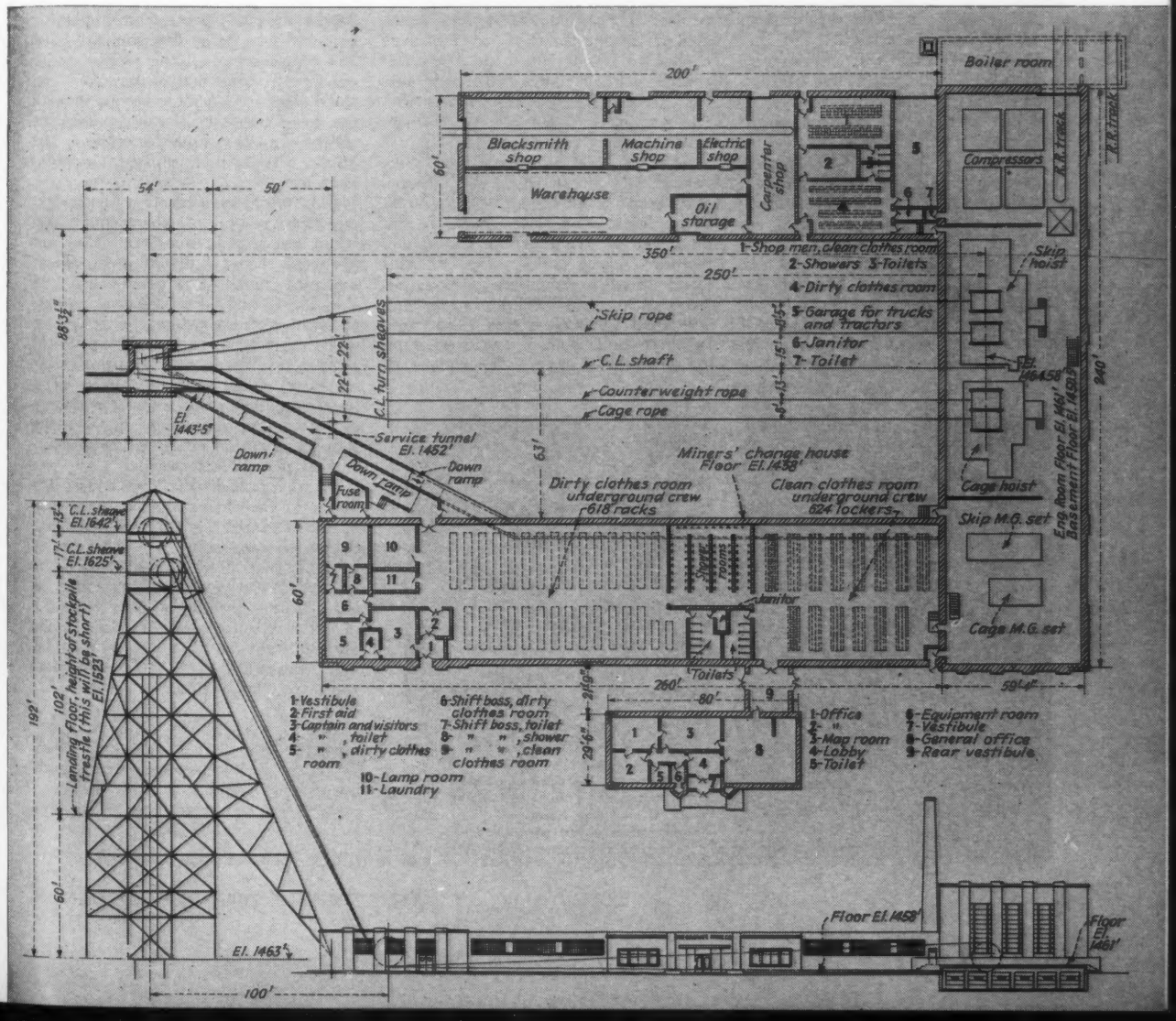
The steel headframe will have 24 legs or posts, each with its concrete pier save for the four legs immediately at the collar. These four, approximately central, columns will be carried on heavily reinforced concrete, already in place, which extends downward through the overburden to the ledge, approximately 49 ft. below the collar, and into the rock (diorite) for another 41 ft. This design, constituting the shaft lining down to this point and distributing the load in the rock through three hitches cut one above the other at the lower end, was made by the Bethlehem engineering staff to provide bearing for the 1,750-ton load of the four columns. The hitches are each 7 ft. long vertically and are spaced 7 ft. apart. Approximately 600 cu.yd. of concrete was poured between the bottom of the lowest hitch 90 ft. below the collar and the collar itself. Of this, the portion extending from the 90-ft. point up to within 25 ft. of the collar was poured by the shaft crew in March. The rest was poured, independently of the shaft sinking, in the months of June and July from the surface within sheet piling.

In design the headframe will be interesting on several counts aside from its height and bulk. The four ropes for the two skips, cage and counterweight respectively, will each pass under a 12-ft. cast-iron sheave placed on the ground as close to the foot of the backstay as possible; thence paralleling the backstay, they will pass



The sinking cage with the car used for hoisting rock. Note the lip at the right over which the tray in the shaft bottom is dumped into the car

Layout of surface plant at the Mather mine. The plan of the mine change house reveals several interesting features. The elevation also shows the headframe in diagrammatic sketch. On the surface adjacent to the plant (in the lower right-hand corner of the drawing) a parking space will be provided for employees' cars



up to and over similar head sheaves, which will be of cast steel. The ropes will be Williamsport 1⅞ in. diameter, 6x27 Type H, flattened strand Langlay, having a breaking strength of 330,000 lb., compared with 184,000 lb. for 1¼-in. 6x19 improved plow-steel rope. They weigh 6.4 lb. per linear foot, compared with 5.63 lb. for the 6x19 rope.

The skips will dump at a point 118 ft. above the collar, their 18-ft. bails continuing up to the 140-ft. point. A removable grizzly will be used to screen out lumps when desired. During the winter the skips will discharge through or over the grizzly into the stockpile car; at other times into the railroad loading bins built in the headframe. These bins are built up to a point 44 ft. above the collar. It is not desired to provide ore storage space in the headframe, because of the tendency of the ore to pack, with resulting difficulties.

To crush the oversize an Allis-Chalmers No. 16 Superior McCully reduction gyratory driven by a 100-hp. induction motor will be provided, suspended from the headframe at a point 101 ft. above the collar. Korfund vibro-isolators (Himelblau Byfield & Co., Milwaukee), will be used in the crusher and motor mountings to absorb the vibrations.

An Otis elevator will be provided in the headframe, with five stations between collar and head sheaves, to permit access to the various points with ease.

For stockpiling there will be three 210-cu.ft., all-steel, 42-in. gage larry cars automatically controlled from a 250-v., d.c. overhead wire. This car has been designed especially by the Lake Shore Engineering Co. to take care of the corners in building the stockpile. The body can swing 180 deg. to dump at any point in the half circle and can move ahead 3½ ft. on its supporting runner when extending the pile. In addition, its down-folding end door extends the delivery point still further, so that extension rails 12 to 15 ft. in length can be used on the pile. The car has eight wheels with a 15-hp. driving motor on each pair. It has hydraulic brakes and an hydraulic dumping mechanism. One of these cars will serve as a spare. A car barn will be provided on the landing floor.

Skip and cage hoists will be of Nordberg make. A feature will be the incorporation of G.E. amplidyne control in conjunction with the customary Ward Leonard system, with consequent simplification. By way of trial, this control is being used on the hoist of the company's Athens mine, at Negaunee, 3 mi. away. This application, it is said, is the first on a mine hoist.

As explained by the Cleveland-Cliffs engineering staff, the new control is effected by short-circuiting two brushes on the amplidyne generator, giving full flux on this generator with a field current of less than 1 amp. Inasmuch as this amplidyne generator supplies the field current of the generator controlling the hoist motor of the Ilgner set, the hoist operation is actually controlled by a field current of less than 1 amp. Previously such control apparatus had to be large enough to handle 100 amp. With amplidyne control, moreover, certain current-limiting features and voltage control can be incorporated which hitherto has been impossible.

The ore hoist will have two cylindrical 12-ft. diameter by 8-ft. drums, one keyed and one loose, with a clutch of the latest axial-plate design. It will be driven by two 1,500-hp. 600 v., d.c. motors (taking 2,600 amp. at full load) through reduction gearing, instead of by one 3,000-hp. motor. It will wind 5,000 ft. of the 1⅞-in. rope in three layers at a maximum rope speed of 2,400 f.p.m. The weight of skip plus connections is 12,000 lb. and that of the ore load 26,880 lb. Both the ore hoist and the cage hoist will have Lilly control with the usual safety devices.

The cage hoist will have only one drum, 12x16 ft. in size, with a center flange, and will be driven through a gear and pinion by one 1,500-hp. motor duplicating the two on the ore hoist. The cage will run on two sets of guides in the shaft to insure smooth travel and will travel at a maximum speed of 2,000 f.p.m. As in the case of the skip hoist, the cage hoisting will be amply protected with safety devices.

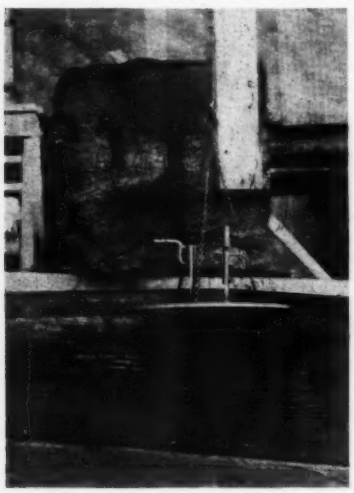
The motor-generator set, with flywheel, for the skip hoist will have two 1,250-kw. generators, a suitable exciter, and a 2,500-hp. wound-rotor type induction motor, with slip regulator equipment for the latter and complete Ward Leonard type, d.c. hoist control equipment including an auxiliary motor-generator set. The set for the cage hoist will have only one 1,250-kw. generator and will be driven by a 1,250-hp. wound-rotor induction motor.

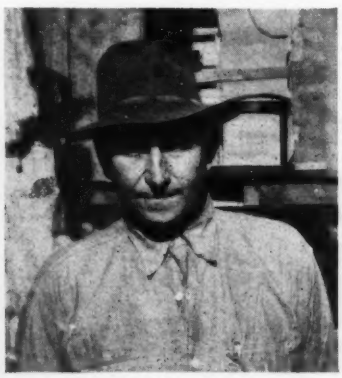
The various buildings on the surface, arranged in an attractive and convenient layout dominated by the headframes, will present an interesting scene. Shops, mine dry, and the hoist and compressor building will be under one roof practically, arranged on three sides of a hollow rectangle with the headframe on the open side, as shown in the line drawing. The offices will be in a separate building near by.

Substantial construction characterizes the design of these buildings, which are already complete. They are fireproof, being built of steel, brick, and glass block. The outside walls of the hoist and compressor building show in a cross-section the following succession: face brick, back-up brick, a 2½-in. air space, and 8½ in. of Cincrete or cinder-concrete block. The last is credited with having the ability to effect approximately 50 percent sound absorption before being painted and 43 percent afterwards.

On the outside the dry house has 8½ in. of face brick and on the inside 3⅞ in. of glazed tile up to a height of 8 ft., the two being separated by a 2½ in. air space. The tile, buff in color, can be washed down with a hose. Above the tile is 5 ft. (height) of glass block and above that 2 ft. more of the tile. The bays are 20 ft. long, center to center, 60 ft. wide (the width of the building), and 15 ft. high.

All shop walls are built of structural tile and double-glaze (separated by an air space) steel sash. The engine house has the same type of sash except where the windows are hinged, in which case single-glaze sash is employed.





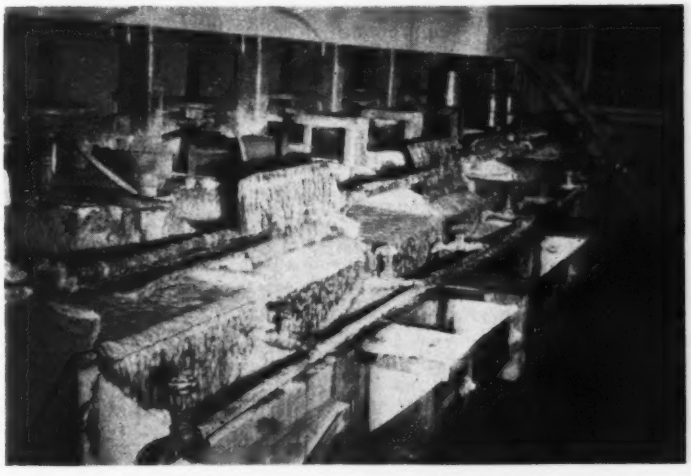
At left is seen the device made by Capt. T. A. Anderson for lining in the steel shaft sets. It has been hung up at the collar to permit its being photographed. The adjacent photo shows Capt. Anderson

Use of Flotation Increases in Illinois Fluorspar Field

Product too fine for recovery in Harz jigs yields 98 per cent concentrate in new plant of Rosiclare company

J. H. Edwards
Electrical Editor

HAVING ADDED a froth-flotation plant to its mill, which for some years has been the world's largest producer of fluorspar, the Rosiclare Lead & Fluorspar Mining Co., at Rosiclare, Ill., is now recovering a 98 percent calcium fluoride concentrate from a minus 10-mesh product carrying from 60 to 70 percent calcium fluoride, which was too fine for gravity separation in Harz-type jigs. This new job, the fourth flotation plant in the Illinois-Kentucky fluorspar district, will serve also as a pilot plant for experimentation looking toward the possibility that a larger flotation plant will be provided by the company sometime in the future.

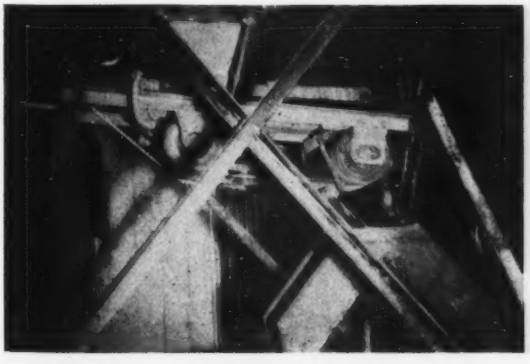


Final calcium fluoride concentrate is skimmed from the cell at the left

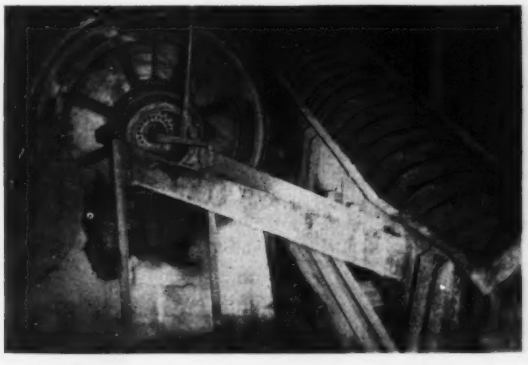
Flotation equipment consists of one battery of eight Denver 22x27-in. sub-aeration Fahrenwald cells. Those and the grinding, conditioning, and water-softening equipment are housed in one building, 24 ft. 6 in. by 48 ft.; and dewatering equipment consisting of a thickener, filter, and necessary pumps in the other building, 30x32 ft. These are wooden structures with steel siding and protected metal roofs. The ore, from yard stockpiles and principally minus 10-mesh, is deposited in the 100-ton elevated outside bin by a locomotive crane. A 12-in. by 18 ft. (c.-c.) belt conveyor moves it to a 1-in. scalping screen, and after being thus freed of sticks and clods of dirt it drops into a 3-ton bin and gravitates to the grinding circuit feeder. Clogging and sticking of the ore in the 3-ton feed bin are prevented by continuous operation of a Syntron V75 electric vibrator attached to a hopper plate of that bin.

A flowsheet, Fig. 1, prepared by John Sheppard, assistant mining engineer, who supervises operating details of the flotation plant, presents a concise outline of the method and equipment. The closed circuit of a Denver ball mill and an Akins classifier is fed

Constant-weight feeder between 3-ton bin and ball mill



Ball mill in closed circuit with classifier



by a Hardinge constant-weight feeder at the rate of 1 ton per hour. A Denver sand pump delivers the minus 35-mesh pulp containing 25 to 30 percent solids to a conditioner of the same make. Conditioner volume affords a 7-minute conditioning period.

Warm water from the power plant surface condenser discharge is put through a Permutit zeolite softener for use in the grinding, classifier, and flotation circuits. This is mine water which has been pumped directly through the condensers. If the mine water gets muddy it is no longer used in the condensers, and instead a cooling tower is put into operation. Then the flotation plant water is taken from the cooling tower basin.

Final concentrate flows by gravity through a launder to the adjacent dewatering building, where it is moved by a bucket elevator to a 16x8 ft. Dorr thickener with a rake speed of ½ r.p.m. The thickened concentrate (40 to 60 percent solids) is fed to a continuous filter by a 2-in. Denver adjustable speed simplex diaphragm pump operating at 50 strokes per minute.

The 2x2-ft. Swenson drum-type filter is covered with 60x60-mesh stainless-steel wire cloth. Vacuum is maintained by a Worthington Type-VV 6½x4 in. double-acting pump operating at 600 r.p.m., effecting a displacement of 93 cu.ft. per minute. Filter capacity is 1½ tons per hour and the moisture content of the filter cake is 4 to 7 percent. It is freed from the wire cloth by a Victor-Acme No. 33 blower. Filtrate with its small percentage of fluorspar is forced back to the thickener by a LaBour filtrate pump. Filter cake is dried in an oil-fired rotary kiln that is a part of the equipment of the old mill.

Principal motors of the flotation and dewatering plant total 40 connected horsepower and include three makes, General Electric, Westinghouse, and Allis-Chalmers. The largest is a 10-hp. Westinghouse, driving the ball mill. Including lighting, the continuous load averages 35 hp. Gearmotors are used on the drives of the elevator, diaphragm pump, and filter drum. Two are Westinghouse and the other is a General Electric. Other drive connections are Gates and American Pulley V-belts. The seven reagent feeders are the Clarkson type manufactured by the American Cyanamid Co.

The flotation plant is one of three major improvements made by the company in the last few years. First a new a.c. generating plant was built. That provided the additional electric power necessary for installation of 1,600-hp. of new mine pumps and for the flotation plant. J. M. Blayney, of St. Louis, is president of the company; A. H. Cronk, superintendent; Rodney McClusky, head mining engineer; and Fred McClusky, mill foreman.

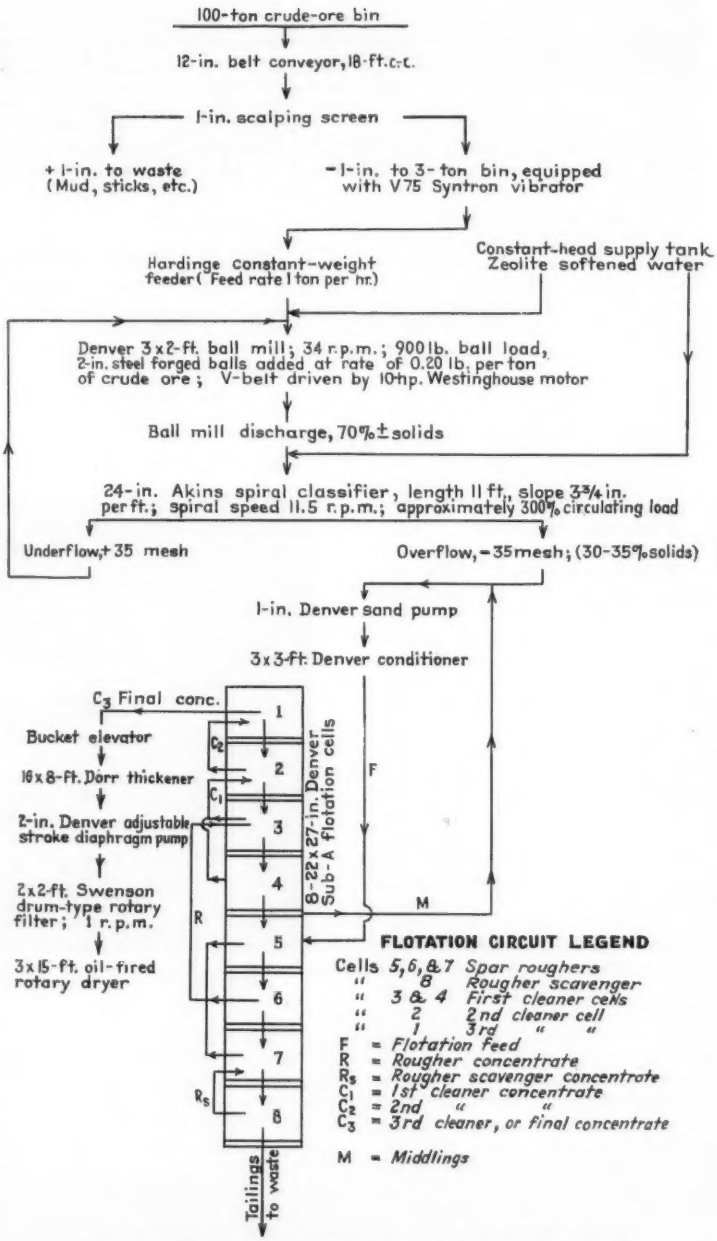

100-ton crude-ore bin
12-in. belt conveyor, 18-ft. c.-c.
1-in. scalping screen
+1-in. to waste (Mud, sticks, etc.)
-1-in. to 3-ton bin, equipped with V75 Syntron vibrator
Hardinge constant-weight feeder (Feed rate 1 ton per hr.)
Constant-head supply tank Zeolite softened water
Denver 3x2-ft. ball mill; 34 r.p.m.; 900 lb. ball load, 2-in. steel forged balls added at rate of 0.20 lb. per ton of crude ore; V-belt driven by 10-hp. Westinghouse motor
Ball mill discharge, 70% ± solids
24-in. Akins spiral classifier, length 11 ft., slope 3¾ in. per ft.; spiral speed 11.5 r.p.m.; approximately 300% circulating load
Underflow, +35 mesh
Overflow, -35 mesh; (30-35% solids)
1-in. Denver sand pump
3x3-ft. Denver conditioner
C3 Final conc.
Bucket elevator
16x8-ft. Dorr thickener
2-in. Denver adjustable stroke diaphragm pump
2x2-ft. Swenson drum-type rotary filter; 1 r.p.m.
3x15-ft. oil-fired rotary dryer
8-22x27-in. Denver Sub-A flotation cells
F
R
M
Rs
Tailings to waste
FLOTATION CIRCUIT LEGEND
Cells 5, 6, & 7 Spar roughers
" 8 Rougher scavenger
" 3 & 4 First cleaner cells
" 2 2nd cleaner cell
" 1 3rd " "
F = Flotation feed
R = Rougher concentrate
Rs = Rougher scavenger concentrate
C1 = 1st cleaner concentrate
C2 = 2nd " "
C3 = 3rd cleaner, or final concentrate
M = Middlings

Fig. 1 . . . Flotation flowsheet of Rosiclare Lead & Fluorspar Mining Co.

Drum filter, adjustable-stroke diaphragm pump, filter blower, and thickener

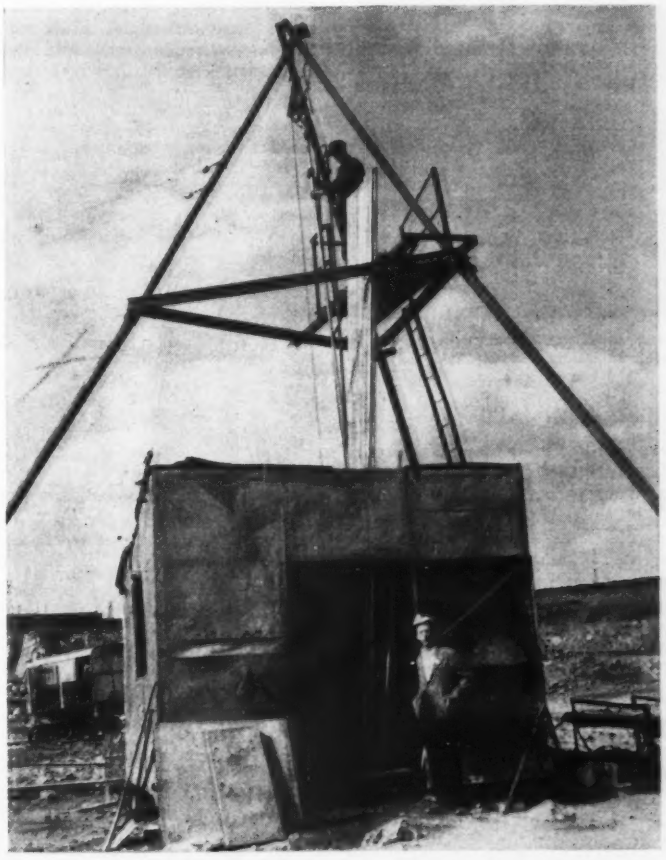
Operating the World's Largest ASBESTOS MINE—II

Limit of open-pit operations is viewed by Canadian Johns-Manville Company, Ltd., as diamond-drilling program collects data for future underground mining

H. C. Chellson
Associate Editor

DIVERSIFIED responsibilities are carried by the engineering department. Chief among them is the appraisal of the ore to be mined on a yearly basis. This appraisal is made from diamond drilling and mine and mill operating records, and permits a forecast of production for the several groups of fibers required by the company's factories and open-market asbestos sales. General mine surveying, mapping, program reports, recording of diamond-drill hole logs, drilling data, and daily mine ore data are some of the routine duties. Recently plans are being studied in preparation for underground mining that may involve shaft sinking within the next five years. George K. Foster heads this department, assisted by William Simpson, John Booth, and Gordon Little.

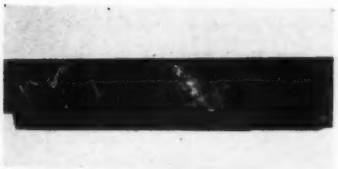
Both calyx and diamond drills have been used to obtain cores. The last calyx hole was sunk in 1930. Diamond drills are now being exclusively used. Approximately 66,000 ft. have been drilled to date. Operations at present call for 2,000 ft. of drilling monthly. Gasoline motor equipped diamond drills with 20 and 30 hp., respectively, are employed. Maximum drilling depth of these machines is about 1,200 ft. All elevations are expressed in relation to sea level and holes are tied into the coordinate system. The deepest hole is 1,177 ft. from the surface and the present drilling program is projected to 350 ft. below sea level, or a depth of 860 ft. below the lowest operating level in the pit, which is at present 510 ft. above sea level. In May this year the 475 cut was started, and later, as requirements demand, the 440 cut will be started, which is expected to be the lowest level possible in open-pit operations. The present drilling program is being done by the company, operations conducted by the mining department and records and logs kept by the engineering department. Holes are being spaced on distances of approximately 200 ft., much closer than previously, to obtain more exact data for future underground mining.



Diamond-drilling sheds are made of sheet iron and insulated with rock wool

A sample of the type of record used in logging drill core containing asbestos is shown in Table II. The number of veins or veinlets of asbestos is recorded according to its location in the hole and its respective width as indicated in the chart. Records of completed holes permit use of an empirical formula to determine the approximate tonnage of various groups of fiber vailable, in the area influenced by each respective drill hole.

Drilling asbestos-bearing rock requires much care because of its uncertain structure. Difficulties are sometimes experienced pumping the sludge and fibers from the hole. The serpentine rock produces, at times, considerable sludge and "cave," which often delays drilling. An average core recovery of 90 percent is obtained at the property with maximum advance of 60 ft., obtained in one shift. The average advance per drilling shift is between 25 and 30 ft. Core recovery



Core specimens with various widths of asbestos fiber are recorded in drill logs shown in Table II

Long asbestos fiber is collected by hand in the pit and brought to the cobbing shed

is one of the important factors in drilling for asbestos.

An oversize bortz AX bit is used. Each bit has 222 diamonds, totaling 15 carats, and average footage obtained per bit to date has been 150 ft. recovering 1⅛-in. core. Bits presently being used are giving footage considerably above the average to date. These data are for the last 3,000 ft. of drilling. Sludge is saved if core recovery is less than 75 percent. The sludge is dried and fiber classified on a standard screening machine.

No wood is used in any part of the drill-shed construction. Made in sections bolted together, the structure measures 12x14x8 ft. The shack rests upon 85-lb. rails, through which anchor bolts hold the drill in position. Moving is simple. The tripod, made of 4-in. and 5-in. pipe, is lifted off its base by a locomotive crane and brought to its new location. The shack and drill are placed on a depressed center flat car and moved. Time required to move and set up ready for drilling is about 8 hours. Where track is not available, tractors are used for moving. Casing of 2-in. standard pipe is used for about the first 10 ft. in serpentine rock, whereas in overburden, 3-in. pipe is employed. Hydraulic quick-setting cement is used as required.

On drilling 6,217 ft., 45 preset bits were used, requiring a total diamond weight of 622.33 carats. The quantity of usable diamonds remaining after this footage of drilling totaled 399.18 carats and the scrap brought back by the diamond supplier totaled 148.63 carats, obtaining $1 per carat. Costs are based on carats consumed in drilling, or 622.33 − 399.18 = 223.15 carat loss. Drilling bit costs in Canadian currency are shown in Table III.

Plant Engineering

Under this heading is placed the operation of the machine shop, electrical department, mill maintenance, mine and mill stores, mechanical and structural engineering departments, and yard gangs. R. A. Denovan heads all these departments. Close cooperaton is required among these divisions and the mill operation because many types of equipment required to process asbestos must be designed and built in the company shops. Demand for certain types of asbestos fibers may require especially designed machinery. Company designers, in collaboration with the mechanical and milling departments, have produced specialized devices, most of which are now in daily use in the mill. Two outstanding designs are the impact crusher or fiberizing machine and screens with special mounting and action. This is described more fully in an article covering the milling practice appearing in our next issue.

The machine shop is near the mill and close to the mine pit and is connected with the main railway line. Considerable equipment is built in the shops, but castings and steel are obtained from several Canadian com-

Table II

Drill Core Log and Fiber Content

Run	Length of Run	Core Recovered	Fiber Veins With These Widths; 1/32	1/16	3/32	1/8	5/32	3/16	7/32	1/4 + 1/2	Remarks
104′ 110′	6′	5′–6″		4	10	3	5		2		M.S.
110′ 120′	10′	10′		6	16	7	9		1	1	M.S.
120′ 124′	4′	4′	2	4	6	3	1				M.S.
124′ 134′	10′	5′–6″	1	7	6	4	1		1		M.S.
134′ 140′	6′	4′–6″	1	7	7	1	1				M.S.
140′ 150′	10′	10′	2	10	2						141–146′ White & Brown Gr. M.S.
150′ 157′	7′	6′	2	5	5	1					M.S.
157′ 164′	7′	5′–6″	1	6	1		2				M.S.
164′ 173′	9′	9′	1	25		10	4		1		M.S.
173′ 180′	7′	6′		13	15	6	2		1		M.S.
180′ 190′	10′	10′	2	16	15	7	5		2	1	M.S.
190′ 196′7″	6′–7″	6′–3″		8	8	5	4	1			M.S.

George K. Foster, mining engineer

R. A. Denovan, in charge of plant engineering departments

Gordon Clark, superintendent of machine shop

panies. Three electrical welding machines are available; also an automatic cutting torch and several welding torches. Several lathes and large planers, drill presses, drill sharpeners and heating furnaces for $\frac{7}{8}$-in. hexagon drill steel used in the mine, and a carpenter shop and pattern shop are also here. Also sheet metal shears to make up the many different sizes of pipes, etc. Gordon Clark is machine-shop superintendent.

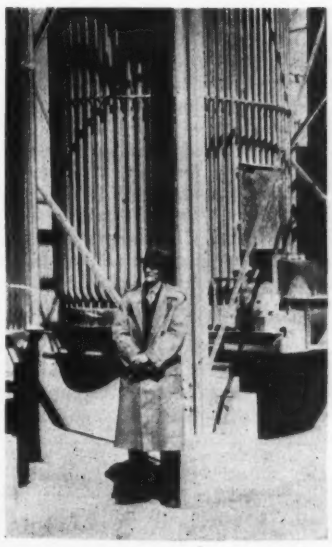
Electrical Department

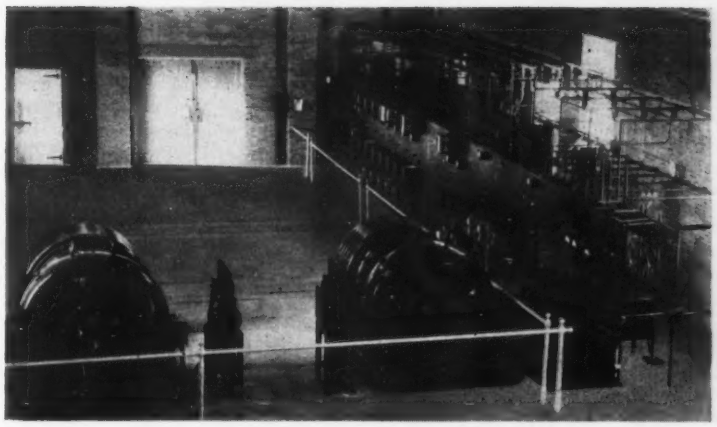
Power is received from Shawinigan Water & Power Co., Shawinigan Falls, Quebec, about 75 miles from Asbestos, Que., at 66,000 volts, and is transformed through the supply company's transformer bank, adjacent to the Canadian Johns-Manville Co.'s power center station, to 2,300 volts. Transformer bank consists of three 5000/3000 kva. 66,000-114,300 volt, and 2,500 volt, single-phase and outdoor transformers. Also, in the secondary side of this bank is a 15,000 kva. oil-immersed, outdoor, automatic voltage regulating transformer.

In the power center station, two 500 kw., d.c. motor generator sets furnish 600 volt direct current for electric haulage. Each generator unit is protected by a high-speed circuit breaker. Eight panels take care of control equipment for the motor generator sets and outgoing d.c. feeders.

There are nine feeder panels on outgoing a.c. feeders servicing mills, mine, factory, machine shop, hotel and hospital. Each feeder is controlled through an oil blast circuit breaker with graphic recording wattmeter and kilowatt-hour meter on each feeder.

A. H. Jackson, superintendent, electrical department





Nine panels on outgoing a.c. feeders service the mill, factory, machine shop, hotel, and hospital. Each feeder is controlled through an oil blast circuit breaker with graphic recording wattmeter and kilowatt-hour meter on each feeder

Panels are made of ebony asbestos wood. Copper tubing is used on main and feeder buses.

An emergency lighting battery unit was recently installed to service station lighting in case of supply company's power failure. The placing of this unit into service is entirely automatic.

Compressed-air service is furnished by one vertical compressor, 1,500-cu.ft. capacity and direct connected to a 300 hp. synchronous motor, and another vertical compressor, 2,800-cu.ft.

Table III

Drilling and Reaming Shell Cost Based on 6,217 Ft. Drilled

Carat loss — 223.15 carats	at $4.00 =	$892.60	
Credit for scrap 148.63 carats	at 1.00 =	148.63	
Net diamond cost drilling bits		$743.97	$743.97
Setting charge and blank bit charge 45 bits	at $4.00 =	180.00	
Sales tax		18.00	
Total setting cost		$198.00	198.00
Total cost of drill bits			$941.97

Diamond and bit cost per foot = 0.1515¢.

Reaming Shell Cost

In 6,331 ft. of drilling 7 reaming shells were used. Total weight of diamonds set was 27.14 carats, from which 13.97 carats were cut out and 6.57 were scrap.

Carat loss	13.17 at $5.00	$65.85	
Credit for scrap	6.57 at 1.00	6.57	
Net cost stones consumed in reaming shells		$59.28	$59.28
Setting charge and blanks		$54.25	
Sales tax		2.80	
		$57.05	57.05
			$116.33

Total cost of reaming shells = $0.0183 per ft., or 1.83¢.

Reaming shells contain 48 stones totaling 12.5 stones per carat or 3.84 carats per shell.

Casing Bit Cost

In drilling 6,447 ft., a casing bit set with 21.12 carats was used. Of this total, 12.40 carats were recovered and scrap totaled 3.35 carats. Footage actually drilled with casing bit was 101 ft.

Carat loss	8.72 carats at $5.00 =	$43.60
Credit for scrap	3.35 carats at 1.00 =	3.35
Net diamond cost for casing bit		$40.25
Setting charges		3.25
Cost of Blank		3.00
Sales tax		0.40
Total casing bit cost		$46.90

Total cost in casing bit = 0.46¢ per foot of casing, or cost per foot of hole drilled is $0.0072, or 0.72¢.

This cost represents casing and drilling in badly fractured ground. Casing bits are designed for placing a 2-in. standard pipe rather than AX flush joint casing. They are set with about 214 stones.

Summary of Total Cost Per Foot of Hole Drilled, 1941

Coring drill bit cost per foot = 6,217 ft.	15.15¢
Reaming shell cost per foot = 6,331 ft.	1.83¢
Casing bit cost per foot = 6,477 ft.	0.72¢
Average total diamond cost per ft.	17.70¢

Diamond consumption (carats)

Drill bits	0.0359 per foot of hole
Reaming shells	0.00208 per foot of hole
Casing bits	0.00135 per foot of hole

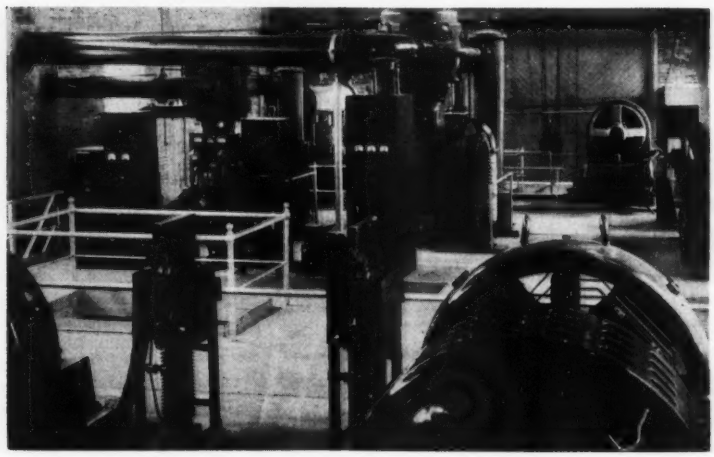
capacity, direct connected to a 500 hp. synchronous motor. Also for standby purposes there is a 1,500-cu.ft. capacity compressor, horizontal type, belted to a 300-hp. wound-rotor, induction motor mounted on a pivoted base.

Equipment for fire protection in the basement of the power center station consists of one fire pump of 1 000 g.p.m., at 125 lb. pressure, 1,725 r.p.m. direct connected to a 100-hp. 2,200-volt induction motor. In case of power failure a six-cylinder gasoline engine-driven pump is always ready for immediate use. The engine is 133 hp. direct connected to a centrifugal pump of 1,000-g.p.m. capacity at 125-lb. pressure, running at 1,600 r.p.m. This unit will supply four $1\frac{1}{8}$ in. smooth nozzles. A third unit is also available in case of both electric power and gasoline engine failure, through an emergency steam driven pump. Steam would then be available from a locomotive through a flexible hose connection to a duplex steam pump, size 18x10x12 in., with a capacity equal to either of the electric or gasoline driven units.

For ordinary service water supply to the mills, a centrifugal pump is direct connected to a 50-hp. induction motor operating on 440 volts, 60 cycle at 1,740 r.p.m. A small centrifugal turbine pump in the same room supplies spring drinking water to the various plants. A large stream-fed artificial pond close to the power center station is the water supply serving these pumps (except the drinking water pump).

The electrical department under A. H. Jackson maintains records of about 487 motors ranging from 750 down to fractional horsepower, also 108 transformers. Total connected horsepower is 18,084. There are 65 lines of company telephones and 36 dispatching phones. This department, in some cases, re-winds its motors and is responsible for floodlighting in the pit and around the plant buildings.

In the south end of the building called the power center are three compressor units of 2,800-, 1,500- and 1,500-cu.ft. capacity respectively. In the foreground is one of two 500-k.w. d.c. motor-generator sets furnishing 600-volt direct current for electric haulage



C. M. McGraw, head of industrial relations department, stands beside a unique Neon safety sign in English and French where the workmen pass each day

Industrial Relations

Both President Brown and Vice President Sherry of Canadian Johns-Manville Co., Ltd., are recognized as men keenly interested in establishing confidence and understanding between its employees and the company. At Asbestos, a shop committee of workmen with representatives in all departments functions as a means of aiding cooperation between management and labor.

Regular monthly meetings are held with the management, at which the men are encouraged to ask questions and air their views concerning matters involving their work or working conditions. It is the policy of the company to attend to all complaints promptly and to keep employees fully informed about all matters affecting them either directly or indirectly.

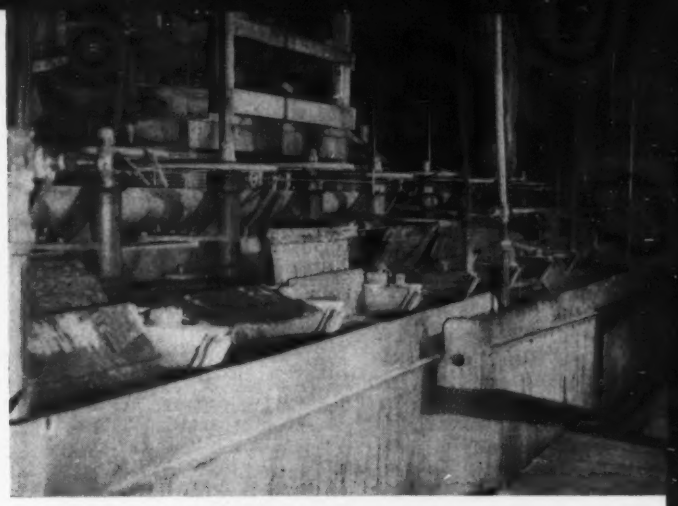
The company has maintained a contract since 1937 with the National Catholic Syndicate, which is the labor union consisting of virtually all workers in the mine, mill, and the local factory. The working agreement is based on a yearly contract involving wage rates, promotion from within the company, and existence of general shop committee, consisting of representatives from all departments. A few religious and national holidays have already been waived in 1941, because of urgent asbestos demand for defense, for which the men were paid time and a half. This close contact with the workers has stimulated confidence and tolerance and intelligent understanding of the daily problems involved in operating a large enterprise upon which may thousands of persons depend for a livelihood. Each year the company makes a practice of giving three scholarships to three boys graduating from the local schools to attend the Sherbrooke technical school.

Meetings of department heads and safety committee chairman are held quarterly to discuss accident-prevention problems. Men are told and reminded in French and English about safety first by signs placed in all working places. The company has a fully equipped hospital and a trained safety engineer and industrial hygiene engineer.

I wish to thank Mr. H. K. Sherry, vice president at Asbestos, and members of his able staff for the time and effort they have contributed to make these articles possible.

In the November issue R. A. Denovan, the head of Plant Engineering, will describe the milling practice at Asbestos.

Preparing Baker Mountain Kyanite for Market



Part of the 10-cell M.-S., flotation machine. The capacity of the flotation section determines the amount of crude kyanite mined

Several products, raw and calcined, are made in the plant adjacent to the mine

A. H. Hubbell
Associate Editor

▶ A BRIEF ACCOUNT *of the kyanite property on Baker Mountain, in south-central Virginia, which is now being worked by Kyanite Products Corporation, was given in the preceding issue of the* JOURNAL, *together with a description of the current mining operations. The earlier attempt at milling made by the McLanahan, Watkins Co. was also dealt with, as well as the subsequent acquisition of the property by Phosphate Recovery Corporation, a subsidiary of International Agricultural Corporation, and the forming of Kyanite Products Corporation, also a subsidiary, which now operates the property. The present milling operations are described in the paragraphs that follow:*

THE CRUSHING PLANT of Kyanite Products Corporation is one of the additions made to the original plant by the Phosphate Recovery Corporation. From the bin the ore is fed through a rack-and-pinion gate into a steel chute, being sluiced with water under ordinary pressure into a 5x12-ft. rotary scrubber, a cylinder of steel plate having at the end a section 3 ft. long of punched-plate screen with 1½-in. round holes. Scrubber oversize goes to a 6x16-in. roll jaw crusher of Sturtevant make, from which the crushed product, together with the undersize, is elevated to a 3x8-ft. Link-Belt vibrating screen having a ¾x⅜-in. rectangular hole. The oversize of this screen is put through a set of 30x10-in. Colorado Iron Works crushing rolls in closed circuit with the screen, and the undersize is elevated to another screen, which is a 3x8-ft. Link-Belt Ty-Rod unit having ⅛x2-in. holes. The oversize of the Ty-Rod screen goes to a 20x14-in. set of Sturtevant crushing rolls and is returned to the elevator ahead of the screen. Up to this point every unit in the crushing plant is driven by a 50-hp. motor through a flat-belt transmission system, except the two screens, which have individual drives.

The Ty-Rod screen undersize, all of which has passed a ⅛x2-in. hole, is the final product of the crushing plant. It is dewatered on a drag of the Esperanza type, the overflow with the clay and fines going to waste and the dewatered kyanite sands to a 20-ton bin.

From this it is fed via a chute and hand gate and a 20-in. conveyor belt to a 3x6-ft. Marcy rod mill. The ground product is elevated and split between two parallel screens, one a 3x8-ft. Link-Belt and the other a 3x6-ft. Leahy. Although both screens are covered with 28-mesh cloth, having an opening of 0.0217 in., or 0.55 mm., the undersize does not exceed 35-mesh (0.41-mm. opening) because the screens are set on a slant. The oversize of both is returned to the Marcy. The minus 35-mesh undersize is dewatered on a 30 in. by 14 ft. 9 in. Akins classifier, the sands of which form the feed of the flotation section. Classifier overflow and the flotation tails are combined for dewatering in 10-ft. cones. The partly clarified cone overflow is pumped back to the crushing plant and the spigot sands are pumped to a tailings dam on the hillside close to the plant. Overflow from the dam goes to the mill supply pond 2,500 ft. away. From this the clarified water is pumped to two 14,000-gal. storage tanks that supply the mill. Thus dirty water is used for crushing and clear water for flotation.

The flotation feed is first conditioned in a two-cell M.-S. machine having cruciform impellers, which serves as an agitator. Here reagents are added. The cells are 30 in. in diameter and 48 in. deep. They overflow to a launder, which delivers the feed to the fifth cell of a 10-cell M.-S. machine, having cells 24 in. square and 12-in. impellers. Concentrates of the first five cells go to cell No. 8 for cleaning in cells 6, 7, and 8, and in turn the cleaned concentrates go to the tenth cell for recleaning in it and cell No. 9. Tails from each cell, beginning with No. 10, overflow into the next lower cell, the final tailings coming off No. 1.

The final recleaned concentrate is dewatered on a 25-ft. chain drag having flights 36 in. wide. Overflow goes to waste. The concentrates fall onto a drainage platform, from which they are shoveled by hand into a small hopper. This feeds onto a conveyor, which delivers to a 30-in. by 20-ft. parallel-flow, oil-fired, rotary dryer. Here the moisture, averaging 15 percent at the start, is taken down to about 1 percent.

Dried concentrates are now elevated to three 4x8-ft. steel bins, first going over a stationary 4-mesh trash screen. From the bins they are passed over a 30-in. five-roll High Intensity Dings magnetic separator. Magnetic material removed is sent to waste. The nonmagnetic minus 35-mesh product of the plant is now ready either for shipment as it is or for finer grinding to customers' specifications or for calcination. It is elevated to a 100-ton wooden bin, from which shipments can be made in bulk if desired, or the kyanite can be drawn off for grinding.

This minus 35-mesh high-grade kyanite is the base product of the plant. It runs 58 percent in Al_2O_3 or better, as compared with 63 percent for the-

oretically pure kyanite. In kyanite content it runs from 92 percent to 94 percent, in Fe_2O_3 1.25 percent, and in free silica 2 percent. The price asked for it is the base price, whatever this may be. Additions are made to the base price for any further operations performed, such as finer grinding, calcining, or bagging.

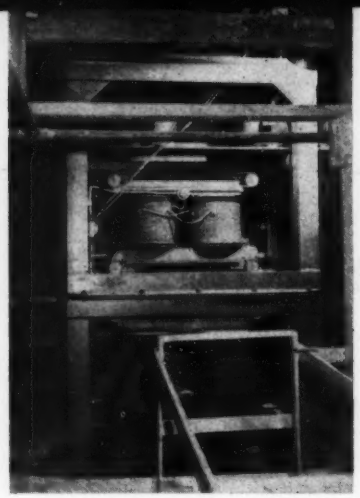
For further grinding or for calcination the 35-mesh material is drawn off from the 100-ton bin through five molasses gates placed along the center line of the bottom. These deliver on to a 14-in. conveyor, and this delivers to another similar belt and so to an elevator, which discharges into a 15-ton steel bin. From this the kyanite is drawn off through one of two molasses gates respectively for calcination or for finer grinding. Each gate discharges into a small hopper with an orifice plate in the bottom which provides a steady flow. Previously a vibrating feeder had been tried but it did not work well under the conditions.

If intended for calcination, the material is delivered directly to the feed end of a 4x60-ft. Traylor rotary calcining kiln. This is brick-lined and is fired with oil counter to the flow, the temperature being 2,750 deg. F. It delivers to a 3x40-ft. rotary cooler directly underneath. This installation can handle 3,500 lb. of feed per hour. The first 10 ft. of the cooler is brick-lined. Over the next 15 ft. an external water spray is used. The rest of the length consists of the unlined shell without any sprays. Here the calcined kyanite is cooled to 175 deg. F. approximately. The cooled product is conveyed by a 6 in. by 20 ft. screw (driven by a sprocket and chain from the elevator boot pulley) to an elevator for screening, on a homemade vibrating trash screen consisting of an inclined flat screen actuated by a Syntron vibrator to remove pellets of kyanite that have fused with iron oxide.

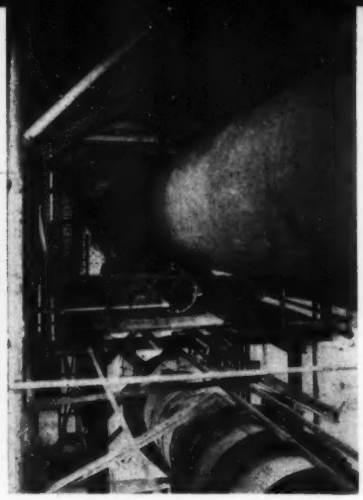
If the calcined product is to be shipped direct, it now goes to a 10-ton bagging bin. If it is to be ground finer in addition to the calcining it is delivered to a 30-ton steel bin ahead of a pebble mill and the dry-grinding circuit.

Dry grinding is done in a 5x16-ft. Traylor pebble mill lined with blocks of North Carolina Salisbury granite and using pebbles of the same material in place of the Danish flint that was employed until it could no longer be obtained. If the grinding is to be merely to 48 mesh, the ground material is delivered to a vibrating trash screen. If, however, the mill is grinding to 100 mesh or finer, the ground material is elevated to a 10-ft. Sturtevant air separator that has been set for the desired mesh and is in closed circuit with the mill. The material discharged as ground goes to a bin for bagging by hand.

Bagging is done at two points, re-

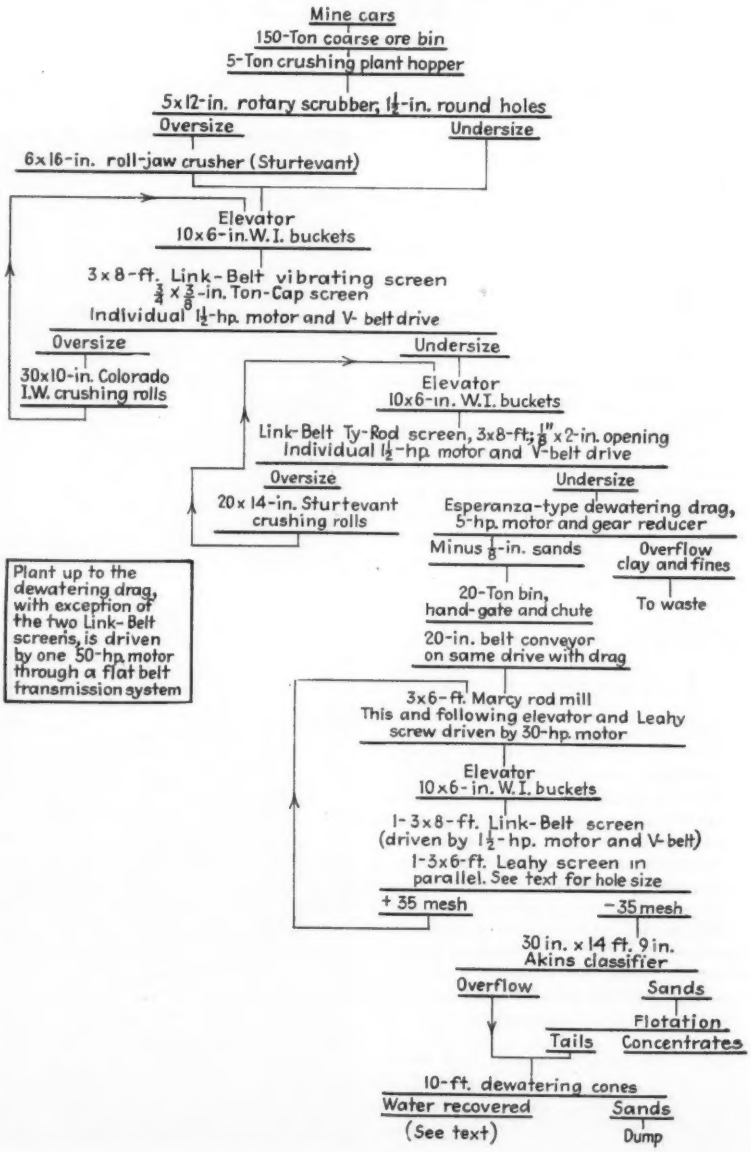


Left, Iron is removed from the dried concentrates by this 30-in. 5-roll High Intensity Dings magnetic separator. Right,



Calcining is done in this 4x60-ft. Traylor rotary kiln. Underneath is the 3x40-ft. cooler

Fig. 1 . . . Flowsheet of the crushing and grinding section of the plant of Kyanite Products Corporation


Mine cars
150-Ton coarse ore bin
5-Ton crushing plant hopper
5x12-in. rotary scrubber, 1½-in. round holes
Oversize
Undersize
6x16-in. roll-jaw crusher (Sturtevant)
Elevator
10x6-in. W.I. buckets
3x8-ft. Link-Belt vibrating screen
¾ x ⅜-in. Ton-Cap screen
Individual 1½-hp. motor and V-belt drive
Oversize
Undersize
30x10-in. Colorado I.W. crushing rolls
Elevator
10x6-in. W.I. buckets
Link-Belt Ty-Rod screen, 3x8-ft; ⅛" x 2-in. opening
Individual 1½-hp. motor and V-belt drive
Oversize
Undersize
20x14-in. Sturtevant crushing rolls
Esperanza-type dewatering drag, 5-hp. motor and gear reducer
Minus ⅛-in. sands
Overflow clay and fines
20-Ton bin, hand-gate and chute
To waste
20-in. belt conveyor on same drive with drag
Plant up to the dewatering drag, with exception of the two Link-Belt screens, is driven by one 50-hp. motor through a flat belt transmission system
3x6-ft. Marcy rod mill
This and following elevator and Leahy screw driven by 30-hp. motor
Elevator
10x6-in. W.I. buckets
1-3x8-ft. Link-Belt screen (driven by 1½-hp. motor and V-belt)
1-3x6-ft. Leahy screen in parallel. See text for hole size
+35 mesh
−35 mesh
30 in. x 14 ft. 9 in. Akins classifier
Overflow
Sands
Flotation Concentrates
Tails
10-ft. dewatering cones
Water recovered
(See text)
Sands
Dump

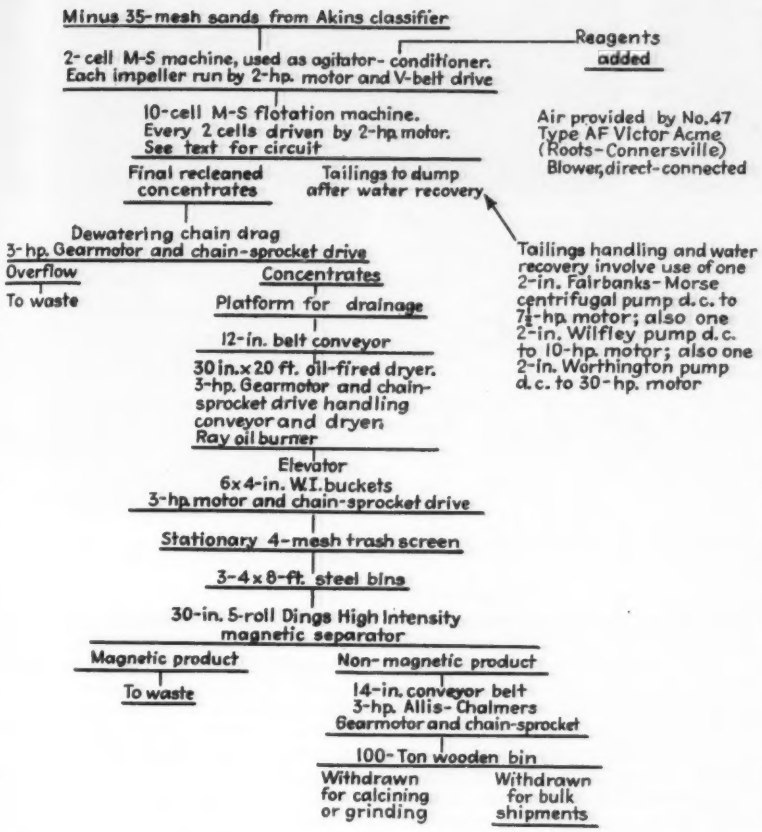

Minus 35-mesh sands from Akins classifier
Reagents added
2-cell M-S machine, used as agitator-conditioner. Each impeller run by 2-hp. motor and V-belt drive
10-cell M-S flotation machine. Every 2 cells driven by 2-hp. motor. See text for circuit
Air provided by No. 47 Type AF Victor Acme (Roots-Connersville) Blower, direct-connected
Final recleaned concentrates
Tailings to dump after water recovery
Dewatering chain drag 3-hp. Gearmotor and chain-sprocket drive
Tailings handling and water recovery involve use of one 2-in. Fairbanks-Morse centrifugal pump d.c. to 7½-hp. motor; also one 2-in. Wilfley pump d.c. to 10-hp. motor; also one 2-in. Worthington pump d.c. to 30-hp. motor
Overflow
To waste
Concentrates
Platform for drainage
12-in. belt conveyor
30 in. x 20 ft. oil-fired dryer. 3-hp. Gearmotor and chain-sprocket drive handling conveyor and dryer. Ray oil burner
Elevator 6x4-in. W.I. buckets 3-hp. motor and chain-sprocket drive
Stationary 4-mesh trash screen
3-4x8-ft. steel bins
30-in. 5-roll Dings High Intensity magnetic separator
Magnetic product
To waste
Non-magnetic product
14-in. conveyor belt 3-hp. Allis-Chalmers Gearmotor and chain-sprocket
100-Ton wooden bin
Withdrawn for calcining or grinding
Withdrawn for bulk shipments

Fig. 2 . . . Flotation of the minus-35-mesh kyanite and the magnetic separation of iron from the concentrate proceed according to this flowsheet

spectively, for the ground kyanite, raw or calcined, and for the 35-mesh product. The latter, however, is usually shipped in bulk. The bags used are five-walled open-mouth paper bags. The bagged material is stored in the warehouse until shipment. This has a capacity sufficient for 7,000 bags. There is also storage space for 120 tons of 35-mesh raw kyanite.

Sampling in the plant for control purposes consists in taking samples of the flotation feed, concentrates and tailings, which are analyzed for iron and kyanite. The iron is determined by the customary wet analysis and the kyanite content by a sink-and-float method. In the magnetic separation plant the feed and the magnetic and non-magnetic products are also sampled and similar determinations are made.

Shipments are started on their way to the railroad, either at Pamplin or at Cullen, in 5-ton trucks. Each of these points is about 7 miles from the plant. Rail shipments are billed as crude kyanite and as ground kyanite, respectively, the rates paid being comparable to those on Indian kyanite, which comes in as boulders. Points of consignment are principally in New Jersey, Pennsylvania, Illinois, Ohio, and Missouri. Some shipments have been made to West Virginia and some as far away as California.

Kyanite plays an important rôle in ceramics, especially in the refractories industry, which is the principal consumer. It is a super-refractory. It withstands the shocks of heating and cooling, as well as erosion by slag. With it can be made a brick having a high melting temperature. Moreover, it does not spall. Its mullite-forming characteristic has already been mentioned. The uses developed for it in the past 20 years include the manufacture of high-temperature furnace cements, saggers and other kiln furniture for the chinaware and pottery trade, glass tank blocks, porcelain, and firebrick. For it the future appears to have a steadily increasing market.

Power for operation is purchased from the Virginia Public Service Co., the total load being 300 hp. Current is brought to the property at 13,200 volts and stepped down to 220 volts in the power company's transformers.

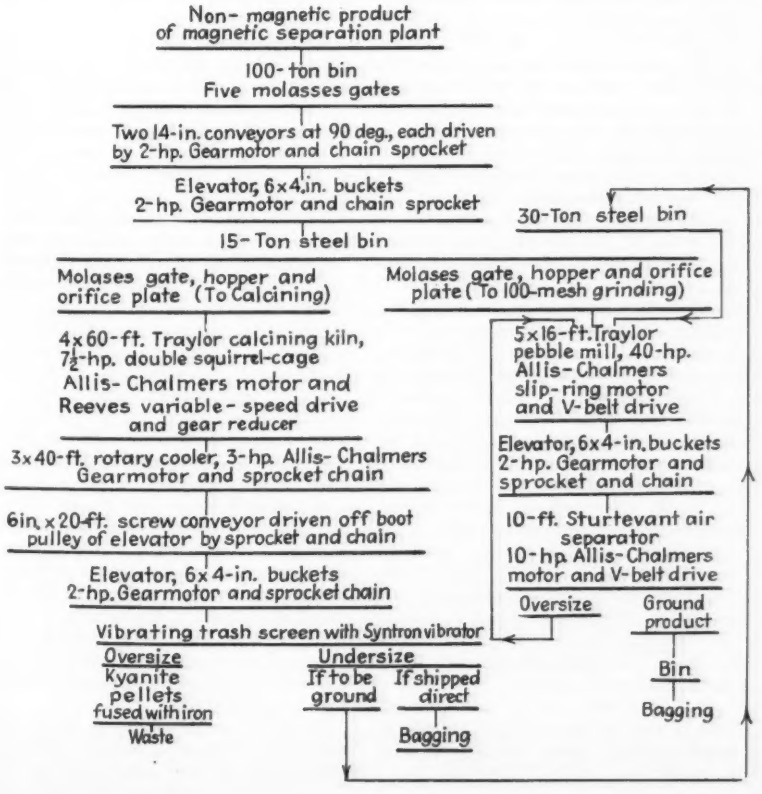

Non-magnetic product of magnetic separation plant
100-ton bin Five molasses gates
Two 14-in. conveyors at 90 deg., each driven by 2-hp. Gearmotor and chain sprocket
Elevator, 6x4-in. buckets 2-hp. Gearmotor and chain sprocket
30-Ton steel bin
15-Ton steel bin
Molases gate, hopper and orifice plate (To Calcining)
Molases gate, hopper and orifice plate (To 100-mesh grinding)
4x60-ft. Traylor calcining kiln, 7½-hp. double squirrel-cage Allis-Chalmers motor and Reeves variable-speed drive and gear reducer
5x16-ft. Traylor pebble mill, 40-hp. Allis-Chalmers slip-ring motor and V-belt drive
3x40-ft. rotary cooler, 3-hp. Allis-Chalmers Gearmotor and sprocket chain
Elevator, 6x4-in. buckets 2-hp. Gearmotor and sprocket and chain
6in. x 20-ft. screw conveyor driven off boot pulley of elevator by sprocket and chain
10-ft. Sturtevant air separator 10-hp. Allis-Chalmers motor and V-belt drive
Elevator, 6x4-in. buckets 2-hp. Gearmotor and sprocket chain
Oversize
Ground product
Vibrating trash screen with Syntron vibrator
Oversize Kyanite pellets fused with iron
Waste
Undersize
If to be ground
If shipped direct
Bin
Bagging
Bagging

Fig. 3 . . . Flowsheet of the operations of calcining and 100-mesh grinding

General view of Iron King mine plant

The flotation-cyanide mill

ORE OCCURRENCE at the Iron King Mine

An interesting example of replacement in schist in Arizona

H. F. Mills

Manager, Iron King Mining Co., Humboldt, Ariz.

THE IRON KING MINE is situated 12 miles east of Prescott, Ariz., on gently rolling hills between the Agua Fria River and the Bradshaw Mountains. The property is of interest because schist replacements are uncommon in the Southwest, and because it is the only producer on the schist in the district. A small production was obtained from oxide ores as early as 1906, and again, twelve years later, some production of heavy iron sulphides was made for flux for the Humboldt smelter. It remained inactive until 1936, when the mine was unwatered and sampled, and sold to the present operators in 1937. Steady shipments of ore from development work and a few stopes were made until October 1938, when the new mill was completed. Since that time all production has been milled, and has averaged 5,800 tons per month. The ore is a complex sulphide, and present milling practice consists of floating a lead concentrate high in precious metals, a zinc concentrate low in gold and silver, followed by cyanidation of the flotation tails for additional recovery of precious metals. Former practice was flotation of a low-grade iron concentrate, following removal of lead and zinc. Because of large tonnages of iron with consequent high marketing costs, a countercurrent cyanide plant was installed last October. Recoveries are fully equal to those formerly obtained, and a plant expansion for increased tonnage is now under way. Principal values are gold and silver in a ratio of two dollars to one, with lead averaging 1.6 percent, and zinc 6 percent. Recovery is largely a matter of degree of grind.

Four thousand feet west of the mine is a rounded hill of granodiorite, locally known as Spud Mountain. Flanking this to the east is a belt of pre-Cambrian schist several miles wide, striking east of north, and dipping at 75 deg. to the west. The orebodies lie in this schist, parallel to the schist in strike and dip. No intrusive rocks have been found in underground workings or by diamond-drill prospect holes, except for a small basaltic dike cutting at right angles to the vein. This dike is very recent, and there is no faulting, nor alteration, of vein by it, except for the several feet that the dike displaces the vein in its crossing. There is also a small basaltic dike several hundred feet in the footwall, parallel to the veins, and exhibiting the same characteristics as the cross dike. The principal points of interest in the Iron King deposits are:

1. A definite and regular echelon pattern of oreshoots with: (a) No cross connection nor wall disturbance between. (b) Definite north geologic ends on each shoot. (c) No geologic south end within the present mine limits on any shoot, the south end being an economic one. (d) The north end of one oreshoot usually marks the economic south end of the shoot immediately in the hanging wall. The distances to connect by crosscut through schist vary from 2 to 10 ft. (e) The echelon and commercial ore is complete from one end of the property to the other. Present length is 3,500 ft., with exploration now being continued to the north.

2. A definite zoning of minerals within each oreshoot, from north to south and to a lesser extent from wall to wall.

3. Very little alteration or impregnation of the enclosing schist walls. At the extreme north end of each shoot the footwall schist becomes oxidized and sericitized, the width of the vein narrows rapidly, and after a short length of white quartz the schist envelopes the end of the ore. Sometimes a short interval of sheared schist with slight oxidation extends north of the ore end, but this rapidly grades into normal schist, indicating an absence of any pronounced faulting in the plane of the veins.

The oreshoots vary in length from 60 to 800 ft., and in widths from a minimum of 3 ft. to a maximum of 14 ft. They exhibit a uniform rake down to the north at 55 deg. The oxide zone is about 150 ft. below the top of the schist. Gold content of the oxides is about the same per cubic foot as in the sulphides, with silver somewhat less, and zinc absent. The contact of oxide to sulphide is sharp. The sulphide ores are heavy, hard sulphides, pyrite being the predominant mineral, and insoluble content ranging from 60 percent down to as low as 10 percent. Microscopic slides indicate a definite order of replacement—pyrite, arsenopyrite, chalcopyrite and sphalerite, tennantite, galena and gold, gangue. The minerals are very finely crystallized, interlocking of minerals, especially of sphalerite and pyrite, being one of the milling problems. Chalcopyrite, arsenopyrite, and tennantite are the best host minerals for gold, but because of the preponderance of pyrite a large part of the total gold is in the pyrite. While the gold is free, it is so fine that none has been visible in any of the mill products except under high magnifications.

Order of replacement is well evidenced by the zoning within each and every shoot. It is evident from the en-

Here the clean line of separation between ore and schist shows behind the driller

closed schist that the north end has been subjected to the heaviest and most recent replacement action. Commencing at that end in a short section of white quartz, the ore grades rapidly into a fine-grained sulphide of better-than-average grade, then into a heavier zinc ore with decreasing precious metal content, then into a more coarsely crystallized pyrite phase, with gradual lessening of precious metals and zinc, until commercial values cease. The vein at the south end holds full width. The zoning along the strike so far has been only partially duplicated at depth. If the same pattern had followed vertically, then only a shallow ore deposit might have been expected, bottoming in low-grade, coarse pyrite. Mining depths at present (600 ft.) are not sufficient to demonstrate a positive vertical change. One vein, the "F," changed into a wide, low-grade, extremely siliceous body between the 400 and 500 levels, but on the 600 level the ore is regaining the characteristics exhibited on the upper levels. Only one oreshoot, the "D," has indicated a definite bottoming in length and width on the 600 level. Grade here is better than usual, but a new shoot is developing in the hanging wall, and is separated from it by only two feet. The grade and nature of the new lens, which apparently is an echelon with depth, is similar to the footwall shoot.

The long oreshoots designated as the "I" and "J" are of recent discovery. They are softer and contain more lead than any of the other orebodies. While they do not exhibit the marked echelon of the other orebodies, within them are the same changes, the oxidation of the footwall and siliceous point in the ore marking a small roll of the footwall toward the hanging wall. These points of change are similar to the north ends of the other shoots. The "D" orebody is centrally situated both across and along the strike, and is more siliceous, lower in zinc, and higher in precious metals than those lying away from it. From development work and prospect diamond-drill holes, it is fairly evident that there is never ore in the footwall of an average grade, and that any crosscutting into the hanging wall passes through the tail ends of each echelon to the north, each being lower in grade than the preceding one because it is further south of the best mineralization. The one exception to this rule is that there is a duplication at the north end of the "A" vein, the "C" being a good grade, very small shoot, and situated between the "A" and "D" veins. Because of the narrow schist bands between shoots, development is nearly all in ore, with waste only from exploratory crosscuts and drifts. Mining is entirely by shrinkage stoping. The walls are quite firm, and dilution averages only 5 percent. Production will be about 100,000 tons per 100-ft. level.

The points on ore occurrence have been intended as observed facts. The lack of wall impregnation, or wall alteration, except at the north ends of each shoot, and the complete replacement between walls with knife-sharp contact between sulphide and schist raise the question as to why the replacements occur as and where they do. Perhaps there were in the schist a series of overlapping dikes or sediments easily replaced, and the sulphides now occupy these positions. However, replacement is so complete that no vestige of the original formation remains. Further development at depth probably will disclose igneous genetic connections, and will help solve the problem as to the source of ore.

Fig. 1 . . . Idealized plan of vein showing zoning of minerals

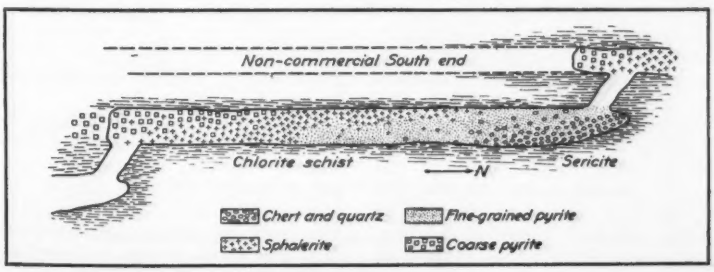
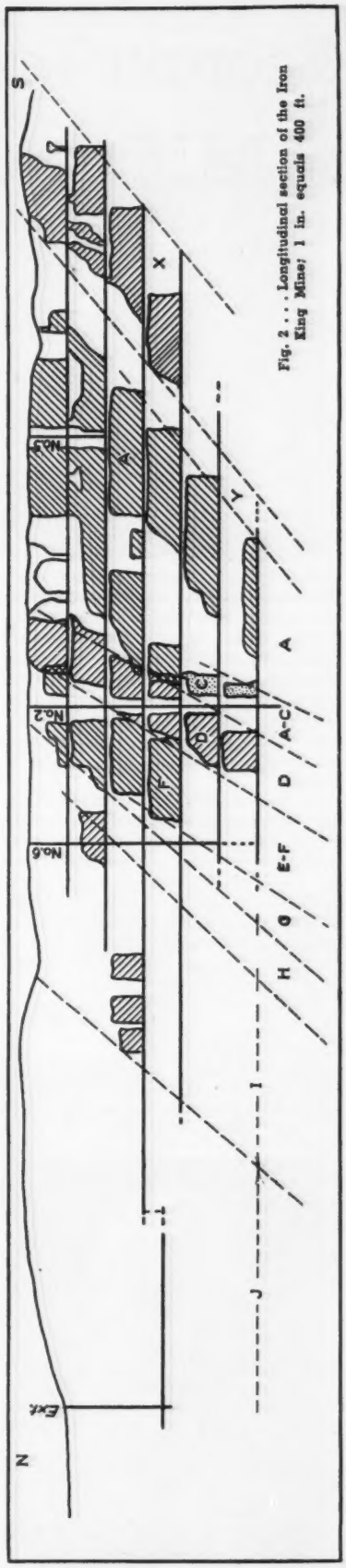


Fig. 2 . . . Longitudinal section of the Iron King Mine; 1 in. equals 400 ft.



Georgia Takes Inventory of Its Mineral Resources

Good results are accruing from its State Survey project

A. H. Hubbell
Associate Editor

Capt. Garland Peyton, director of the Division of Mines, Mining and Geology, State Capitol, Atlanta, Ga. Photo by Bon-Art Studios, Inc.

GEORGIA'S KNOWN RESOURCES of minerals are sufficiently abundant and widely enough scattered over the State's 59,265 sq.mi. of territory to justify the expectation that they can be materially increased by planned prospecting. This wealth, as indicated from past production and present operations, consists mainly in non-metallic minerals, including kaolin, fuller's earth, bauxite, barytes, and ocher, with manganese and iron as the principal representatives of the metal group. The State has long had its own Geological Survey, or, better, its Division of Mines, Mining and Geology, headed today by Captain Garland Peyton.

In March, 1940, the so-called State Mineral Survey was established with Federal aid, this being a Work Projects Administration project sponsored by Captain Peyton's Division, with various co-sponsors including the State Planning Board, the Highway Department, the Georgia Engineering Experiment Station, and the various county commissioners.

The purpose at the outset, according to Captain Peyton, was to make a more thorough inventory of the State's mineral resources, utilizing W.P.A. labor properly supervised by competent field engineers and geologists, in those counties where permission was obtained to launch units of this cooperative survey. Results obtained were to be available to the public. Later, when the nation entered upon the present defense program, it was deemed advisable to concentrate efforts on a search for defense minerals, and this policy has largely been followed since.

Robert C. Beckstrom, State Supervisor of W.P.A. project 6371, under which official designation the State Mineral Survey of Georgia is being conducted

At the head of the project is a State Supervisor, Robert C. Beckstrom, who makes his headqaurters in Atlanta. The State Office includes, in addition, assistant State Supervisors, engineers, an office manager, a mineralogist, a chemist, and a ceramist. The work is organized by counties, each under a County Supervisor, who is usually a graduate engineer or geologist with mining or prospecting background and experience.

To provide funds a Federal appropriation of $300,000 was made on a State-wide basis, to serve for the payment of salaries, for qualified help and supervisors, and for materials, supplies, and transportation, with the proviso that the sponsor contribute 25 percent of the project's total cost. The Federal funds appropriated pass through the normal W.P.A. channels, as does the work itself.

Of Georgia's 159 counties work has thus far been undertaken in 21, though temporarily stopped in a few of them because of lack of help and the national defense program. The number of workers in the field crews has ranged, with two or three exceptions, from 20 to as high as 85, the figure for Bartow County, wherein the Cartersville district is situated. In 41 of the remaining counties, the commissioners, companies, or individuals have asked that groups be organized for prospecting purposes.

The State Supervisor and the County Supervisors plan the work that will best yield the information desired by the sponsor. Areas to be prospected are selected by the State Geologist or by property owners if they have definite knowledge of existing deposits. The County Supervisor also scans his county for likely areas, and State and Federal bulletins are studied in the hope of disclosing them. A written consent is secured from each property owner before any work is done on his land.

Samples are taken from each pit, shaft, or test hole, and properly numbered and tagged, each with the information as to how it was taken. From them a selection is made by the supervisors for analysis in the laboratory at the Atlanta office. The results are turned over to the State Office, where they become part of the final report. This at the proper time is released to the public through the State Division of Mines, Mining and Geology.

In the past year, much sinking, test-pitting, and trenching have been done in Troup County, uncovering a not inconsiderable quantity of chromite, together with asbestos, vermiculite, talc, and serpentine. Subsequent diamond drilling has shown the continuation of the chromite down to 100 ft. and even somewhat deeper in places, one section of core from this depth being almost solid chromite. The chromite in the cores, however, has ranged for the most part from a maximum of 25 percent down to 2 or 3 percent. According to the State Geologist, the indications are that appreciable quantities of commercial ore will be found, which could be mined if need becomes great enough, though not any large tonnage.

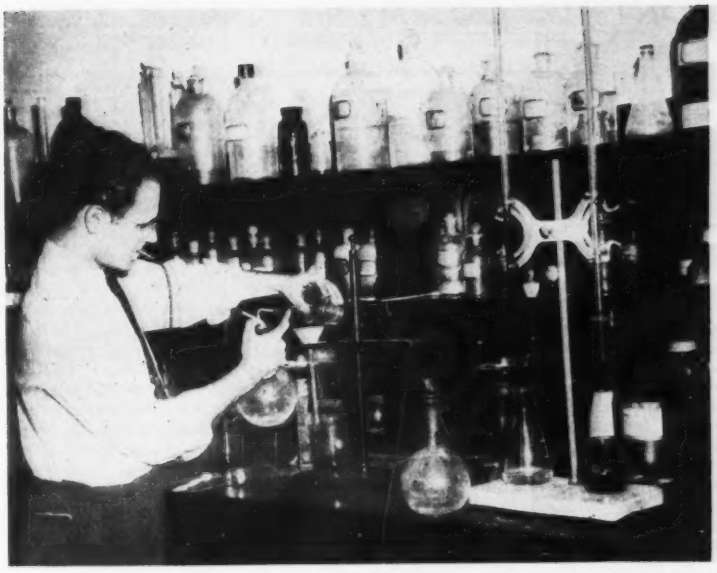
A rather large deposit of serpentine in Columbia County, 16 miles northwest of Augusta, has also been found and investigated by the Survey. This Captain Peyton declares to be notably free from talc, silica, and carbonates. He states that a process for producing

soluble compounds of magnesium from it has been worked out in the Division of Mines' laboratory in Atlanta.

In Bartow County, which has a considerable production of manganese and manganiferous iron ores to its credit in the past and is still producing, the project has included a preliminary survey, recently completed, of the tonnage of available manganese tailings that have been accumulating for years in ponds and waste dumps. This was done for a Federal procurement agency and the results are said to indicate the existence of at least 100,000 tons of recoverable ore.

The work done on iron ores is increasingly bearing fruit. Several new operations have been started in the Bartow-Polk County area and considerable tonnages of brown ores and manganiferous ores are being shipped to Birmingham and elsewhere.

Other minerals important in respect to defense, which have been investigated with resultant finds of new deposits, include asbestos, mica, sericite, kyanite, magnetic iron ore, vermiculite, glass sand, and high-grade silica in the form of massive quartz and quartzite. In addition, work has been done on the clays, on ordinary sands and gravels, pyrite, gold, talc, agricultural limestone, shale, and bentonite, and also on water resources. In respect to the last, the work has included the mapping and measuring of wild, flowing artesian wells on the coastal plain of Georgia, with a view to shutting them off as a measure for conserving the underground aquifers. This investigation appears of greater importance when it is remembered that at many points along the coast wells which formerly would flow to a height of 50 ft. above the surface have been so lowered that the water must be pumped from a point 50 ft. below.



In the chemical laboratory of the Division of Mines, Mining, and Geology, in the State Capitol at Atlanta. I. Goldstein, assistant chemist. Photo by Walter Sparks

Bartow County has the largest force of workmen, 85 in number, engaged in field work of any of the counties. The crews are in charge of Joe Porterfield, Assistant State Supervisor, here standing beside one of the shafts on Iron Hill, an iron-ore property some miles west of Cartersville

One of the prospect shafts showing windlass, timbers, cable, and bucket. Note the safety belt on the workman. Photo by Walter Sparks

Summary of the

MARKETS

SEPTEMBER brought no upward revisions in domestic prices for major non-ferrous metals. Following an adjustment in the price of zinc concentrate in the Tri-State district, there was talk of raising the price of slab zinc a fraction of a cent, but the move to lift the quotation was dropped pending study of the situation by OPA. The reduction in the price of aluminum to 15c. a pound, announced a month ago, became effective Oct. 1. In spite of the recent warning on prices, quicksilver advanced $1 per flask. Antimony was unchanged: sales are being restricted.

The *E.&M.J.* index of non-ferrous metal prices for September was 83.34, against 83.39 for August. Ceiling prices on copper and tin made for lower monthly averages in those metals, which accounts for the modest drop in the index.

Apparent domestic consumption of copper during August, based on shipments by mills and foundries, was estimated at 140,000 tons, a new monthly high. During the first eight months of 1941, apparent consumption averaged 132,000 tons a month, against 73,438 tons monthly in the Jan.-Aug. period last year. Extension of the deal to acquire copper from Latin American countries neared completion as September ended and it appears likely that 11¼c. United States ports will be paid by Metals Reserve. The old contract was at 10c. As a result of these developments, the free market for foreign copper advanced on Sept. 26 to 11½c., f.a.s.

Sales of copper in the domestic market amounted to 94,558 tons in September. All of the business was booked on the basis of 12c., Valley.

Consumers obtained 83,000 tons of lead during August, of which 28,000 tons was released by Metals Reserve. Current apparent consumption amounts to about 85,000 tons. Imports will have to be maintained at a high rate, authorities believe. The price held at 5.85c., New York.

The zinc "pool" for October continued at 27 percent. Producers of zinc oxide and zinc dust are not required to set aside part of their production for October use.

UNITED STATES MARKET

1941 Sept.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1	Holiday	10.950	Holiday	Holiday	Holiday	Holiday
2	11.775	10.950	52.000	5.85	5.70	7.25
3	11.775	10.950	52.000	5.85	5.70	7.25
4	11.775	10.950	52.000	5.85	5.70	7.25
5	11.775	10.950	52.000	5.85	5.70	7.25
6	11.775	10.950	52.000	5.85	5.70	7.25
8	11.775	10.950	52.000	5.85	5.70	7.25
9	11.775	10.950	52.000	5.85	5.70	7.25
10	11.775	10.950	52.000	5.85	5.70	7.25
11	11.775	10.950	52.000	5.85	5.70	7.25
12	11.775	10.950	52.000	5.85	5.70	7.25
13	11.775	10.950	52.000	5.85	5.70	7.25
15	11.775	10.950	52.000	5.85	5.70	7.25
16	11.775	10.950	52.000	5.85	5.70	7.25
17	11.775	10.950	52.000	5.85	5.70	7.25
18	11.775	10.950	52.000	5.85	5.70	7.25
19	11.775	10.950	52.000	5.85	5.70	7.25
20	11.775	10.950	52.000	5.85	5.70	7.25
22	11.775	10.950	52.000	5.85	5.70	7.25
23	11.775	10.950	52.000	5.85	5.70	7.25
24	11.775	10.950	52.000	5.85	5.70	7.25
25	11.775	10.950	52.000	5.85	5.70	7.25
26	11.775	11.450	52.000	5.85	5.70	7.25
27	11.775	11.450	52.000	5.85	5.70	7.25
29	11.775	11.450	52.000	5.85	5.70	7.25
30	11.775	11.450	52.000	5.85	5.70	7.25
	AVERAGES FOR MONTH					
Sept.	11.775	11.027	52.000	5.850	5.700	7.250
	AVERAGES FOR WEEK					
Sept. 3	11.775	10.950	52.000	5.850	5.700	7.250
10	11.775	10.950	52.000	5.850	5.700	7.250
17	11.775	10.950	52.000	5.850	5.700	7.250
24	11.775	10.950	52.000	5.850	5.700	7.250
	CALENDAR WEEK AVERAGES					
Sept. 6	11.775	10.950	52.000	5.850	5.700	7.250
13	11.775	10.950	52.000	5.850	5.700	7.250
20	11.775	10.950	52.000	5.850	5.700	7.250
27	11.775	11.117	52.000	5.850	5.700	7.250

SILVER, GOLD AND STERLING EXCHANGE

1941 Sept.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver: (c) New York	Silver: London	Gold: London	Gold: (d) United States
1	Holiday	(f)	Holiday	23.5000	168s	Holiday
2	401.000	(f)	34.750	23.5000	168s	$35.00
3	401.000	(f)	34.750	23.5000	168s	35.00
4	401.000	(f)	34.750	23.5000	168s	35.00
5	401.000	(f)	34.750	23.5000	168s	35.00
6	401.000	(f)	(e)	(e)	(e)	35.00
8	401.000	(f)	34.750	23.5000	168s	35.00
9	401.000	(f)	34.750	23.5000	168s	35.00
10	401.000	(f)	34.750	23.5000	168s	35.00
11	401.000	(f)	34.750	23.5000	168s	35.00
12	401.000	(f)	34.750	23.5000	168s	35.00
13	401.000	(f)	(e)	(e)	(e)	35.00
15	401.000	(f)	34.750	23.5000	168s	35.00
16	401.000	(f)	34.750	23.5000	168s	35.00
17	401.000	(f)	34.750	23.5000	168s	35.00
18	401.000	(f)	34.750	23.5000	168s	35.00
19	401.000	(f)	34.750	23.5000	168s	35.00
20	401.000	(f)	(e)	(e)	(e)	35.00
22	401.000	(f)	34.750	23.5000	168s	35.00
23	401.000	(f)	34.750	23.5000	168s	35.00
24	401.000	(f)	34.750	23.5000	168s	35.00
25	401.000	(f)	34.750	23.5000	168s	35.00
26	401.000	(f)	34.750	23.5000	168s	35.00
27	401.000	(f)	(e)	(e)	(e)	35.00
29	401.000	(f)	34.750	23.5000	168s	35.00
30	401.000	(f)	34.750	23.5000	168s	35.00
	AVERAGES FOR MONTH					
Sept.	401.000	....	34.750	23.5000	....	35.00
	AVERAGES FOR WEEK					
Sept. 3	401.000	....	34.750	.....	....	.....
10	401.000	....	34.750	.....	....	.....
17	401.000	....	34.750	.....	....	.....
24	401.000	....	34.750	.....	....	.....

Calendar week averages, New York Silver: 6th, 34.750; 13th, 34.750 20th, 34.750; 27th, 34.750.

(e) Not quoted (Saturday). (f) No quotation.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the European War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. To arrive at the f.o.b. refinery quotations deduct .05 from the f.a.s. basis for lighterage.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade Zinc delivered in the East and Middle West in nearly all instances command a premium of 1c per pound over the current market for Prime Western but not less than 1c over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c per troy ounce. Handy & Harman's quotation on newly-mined domestic silver, 999 fine was 70⅝c throughout September.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which at present is equal to $34.9125.

PRICES OF METALS • MISCELLANEOUS QUOTATIONS

LONDON MARKET

Sept. 1941	Tin—Standard—Spot	Tin—Standard—3 months
1	256.7500	259.2500
2	256.2500	259.2500
3	256.2500	259.2500
4	256.0000	259.2500
5	256.0000	259.0000
8	257.0000	259.7500
9	257.7500	260.2500
10	257.0000	259.7500
11	256.5000	259.5000
12	256.2500	259.5000
15	257.0000	259.7500
16	256.7500	259.5000
17	256.5000	259.5000
18	256.0000	259.2500
19	256.0000	259.2500
22	256.2500	259.5000
23	256.0000	259.2500
24	255.7500	259.2500
25	256.0000	259.7500
26	256.0000	259.7500
29	256.0000	259.7500
30	256.0000	260.2500
Average for month	256.364	.....

Official tin prices on London Metal Exchange in long tons, pound sterling. Trading in copper, lead, and zinc suspended August August 31, 1939.

Weekly MARKET INFORMATION Service

- E&MJ Metal & Mineral Markets, the weekly price information service of Engineering & Mining Journal, will keep you in close touch with effects of war developments on costs and availability of metals and non-metallic minerals.
- Printed and mailed every Wednesday night, E&MJ Metal & Mineral Markets will speed to you as special newspaper mail. It carries daily and weekly average prices of metals for the preceding six market days.
- Rates: $5 a year in the United States and possessions, and in the Americas; $10 a year elsewhere. Address:

E&MJ METAL & MINERAL MARKETS

Dept. 101 330 West 42nd Street New York, N. Y.

CURRENT PRICES — MISCELLANEOUS METALS, ORES, AND NON-METALLIC MINERALS

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(Oct. 1, 1941)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb	14.00c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	27c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$36.00
Quicksilver, flask of 76 lb., 100 flasks or more	$193.00
Radium, mg. radium content	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, lb	16.50c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, f.o.b. mines, ton	$30.00@$35.00
Chrome Ore, 48 @ 50% Cr_2O_3 c.i.f. Atl. ports, long ton	(b)$45.00@$48.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$68.64
Manganese Ore, (foreign) c.i.f. U.S. ports, long ton unit of **Mn:**	
52 @ 55 per cent	(b) 70c.
50 @ 52 per cent	(b) 70c.
46 @ 48 per cent	(b) 65c.
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.50
Domestic, 65 per cent and upward	(a)$24.00@$25.00
Vanadium Ore, per lb. of contained V_2O_5	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$48.58

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal.

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00
Sodium Nitrate, ex vessel, in 200-lb. bags, per 100 lb	$1.43
Sodium Sulphate, bulk, ton	$18.00@$24.00

ALLOYS

Beryllium Copper, master alloy, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent chromium, 4 @ 6 per cent carbon, per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$120.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 percent, gross ton	$74.50
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90@$2.00
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U.S. funds), ton;	
Crude No. 1	$700@$750
Crude No. 2	$150@$350
Spinning fibers	$110@$200
Paper stock	$40@$49.50
Shorts	$13@$17.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$57.00@$60.00
Paper stock	$40.00@$48.00
Shorts	$13.00@$26.00
Floats	$18.00
Barytes, long ton:	
Georgia, crude	$8.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.00@$6.50
Bauxite, long ton:	
Domestic, crude, 50 @ 52 percent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$14.50
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85–5 per cent, all rail movement, ton	$23.00
Ground, 95 @ 98 percent, bulk, ton	$32.00
Lump, acid, 98 percent, bulk, ton	$30.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton:	
Dead-burned, f.o.b. California	$25.00
Dead-burned, f.o.b. Washington	$22.00
Mica, per lb., North Carolina, No. 1 and 2 quality:	
1½ x 2 in.	45@65c.
2 x 2 in.	60@85c.
3 x 3 in.	$1.85@$2.05
3 x 4 in.	$2.15@$2.25
3 x 5 in.	$2.50@$2.75
White, ground, 70 mesh, ton	$60.00@$80.00
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12c
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
New Jersey, mineral pulp	$8.50@$10.50
Vermont, extra white, 200 mesh	$9.50@$10.00
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

(a) Nominal

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton:	
Bessemer	$24.50
Basic	$23.50
No. 2 Foundry	$24.00
Steel, base prices, Pittsburgh:	
Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10
Bars, 100 lb	$2.15

Monthly and Yearly

AVERAGE PRICES

SILVER AND STERLING EXCHANGE

	New York		London Spot		Sterling Exchange	
	1940	1941	1940	1941	1940	1941
January	34.750	34.750	21.892	23.273	395.442	(a) 402.000
February	34.750	34.750	20.935	23.341	395.652	(a) 401.864
March	34.750	34.750	20.763	23.446	375.212	(a) 401.788
April	34.750	34.750	20.713	23.500	351.817	(a) 401.058
May	34.949	34.750	21.878	23.457	326.452	(a) 400.981
June	34.825	34.750	22.688	23.400	359.560	(a) 401.000
July	34.750	34.750	22.095	23.397	379.750	(a) 401.000
August	34.750	34.750	23.261	23.459	396.889	(a) 401.000
September	34.750	34.750	23.446	23.500	401.646	(a) 401.000
October	34.750	.....	23.451	.....	401.692	.....
November	34.750	.....	23.238	.....	401.783	.....
December	34.750	.....	23.015	.....	402.000	.....
Year	34.773	.....	22.281	.....	382.325	.....

New York quotations for silver other than newly-mined domestic, cents per ounce troy, 999 fine, London pence per ounce sterling silver 925 fine. Sterling exchange (pound sterling) in cents. (a) Nominal.

COPPER

	F.O.B. Refinery, Electrolytic			
	Domestic		Export	
	1940	1941	1940	1941
January	11.954	11.819	11.999	10.257
February	11.148	11.794	11.471	10.414
March	11.160	11.814	11.407	10.592
April	11.087	11.820	11.258	10.952
May	11.079	11.815	11.191	10.950
June	11.128	11.810	11.216	10.950
July	10.564	11.812	10.189	10.950
August	10.708	11.778	9.851	10.950
September	11.296	11.775	9.849	11.027
October	11.826	.....	10.436	.....
November	11.800	.....	10.084	.....
December	11.802	.....	10.293	.....
Year	11.296	.....	10.770	.....

New York quotations, cents per pound.

LEAD

	New York		St. Louis	
	1940	1941	1940	1941
January	5.471	5.500	5.321	5.350
February	5.076	5.602	4.926	5.452
March	5.192	5.765	5.042	5.613
April	5.071	5.850	4.921	5.700
May	5.015	5.850	4.865	5.700
June	5.000	5.850	4.850	5.700
July	5.000	5.850	4.850	5.700
August	4.854	5.850	4.704	5.700
September	4.929	5.850	4.779	5.700
October	5.308	.....	5.158	.....
November	5.726	.....	5.578	.....
December	5.500	.....	5.350	.....
Year	5.179	.....	5.029	.....

New York and St. Louis quotations, cents per pound.

TIN

	Straits New York		Standard, Spot London	
	1940	1941	1940	1941
January	46.707	50.154	240.716	256.648
February	45.851	51.293	242.833	264.975
March	47.079	52.067	251.711	270.131
April	46.815	51.981	252.080	269.775
May	51.570	52.166	264.098	267.534
June	54.618	52.685	273.438	262.750
July	51.591	53.481	265.592	258.272
August	51.176	52.385	262.455	257.013
September	50.348	52.000	251.024	256.364
October	51.490	.....	257.946	.....
November	50.577	.....	258.214	.....
December	50.101	.....	256.988	.....
Year	49.827	.....	256.425	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

ZINC

	St. Louis		
	1939	1940	1941
January	4.500	5.644	7.250
February	4.500	5.534	7.250
March	4.500	5.750	7.250
April	4.500	5.750	7.250
May	4.500	5.803	7.250
June	4.500	6.235	7.250
July	4.516	6.250	7.250
August	4.719	6.389	7.250
September	6.104	6.920	7.250
October	6.500	7.250	.....
November	6.500	7.250	.....
December	5.980	7.250	.....
Year	5.110	6.335	.....

St. Louis quotations, Prime Western, cents per pound.

CADMIUM AND ALUMINUM

	Cadmium		Aluminum	
	1940 (a)	1941 (a)	1940	1941
January	79.038	80.000	20.000	17.000
February	80.000	82.273	20.000	17.000
March	80.000	89.038	19.769	17.000
April	80.000	90.000	19.000	17.000
May	80.000	90.000	19.000	17.000
June	80.000	90.000	19.000	17.000
July	80.000	90.000	19.000	17.000
August	80.000	90.000	18.000	17.000
September	80.000	90.000	18.000	17.000
October	80.000	.....	18.000	.....
November	80.000	.....	17.522	.....
December	80.000	.....	17.000	.....
Year	79.920	.....	18.691	.....

Aluminum in cents per pound, 99 plus per cent grade. Cadmium, cents per pound. (a) Producers' price, commercial sticks.

ANTIMONY, QUICKSILVER, AND PLATINUM

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) New York	
	1940	1941	1940	1941	1940	1941
January	14.000	14.000	156.962	165.846	40.000	36.000
February	14.000	14.000	178.000	170.182	40.000	36.000
March	14.000	14.000	180.921	177.692	40.000	36.000
April	14.000	14.000	173.538	180.077	38.923	36.000
May	14.000	14.000	181.538	180.000	38.000	36.000
June	14.000	14.000	197.360	183.920	38.000	36.000
July	14.000	14.000	194.423	188.577	38.000	36.000
August	14.000	14.000	184.111	192.000	38.000	36.000
September	14.000	14.000	173.333	192.440	36.167	36.000
October	14.000	.....	168.846	.....	36.000	.....
November	14.000	.....	168.391	.....	36.000	.....
December	14.000	.....	164.960	.....	36.000	.....
Year	14.000	.....	176.865	.....	37.924	.....

(a) Antimony, cents per pound, ordinary brands, in cases; in bulk f.o.b. Laredo, Tex., 13.000 for September. (b) Quicksilver, dollars per flask of 76 lb. (c) Platinum, per ounce troy.

PIG IRON

	Bessemer		Basic		No. 2 Foundry	
	1940	1941	1940	1941	1940	1941
January	23.50	24.50	22.50	23.50	23.00	24.00
February	23.50	24.50	22.50	23.50	23.00	24.00
March	23.50	24.50	22.50	23.50	23.00	24.00
April	23.50	24.50	22.50	23.50	23.00	24.00
May	23.50	24.50	22.50	23.50	23.00	24.00
June	23.50	24.50	22.50	23.50	23.00	24.00
July	23.50	24.50	22.50	23.50	23.00	24.00
August	23.50	24.50	22.50	23.50	23.00	24.00
September	23.50	24.50	22.50	23.50	23.00	24.00
October	23.50	.....	22.50	.....	23.00	.....
November	23.50	.....	22.50	.....	23.00	.....
December	23.50	.....	22.50	.....	23.00	.....
Year	23.500	.....	22.500	.....	23.000	.....

Iron, dollars per long ton. F.o.b. Mahoning and Chenango Valley furnaces.

USEFUL OPERATING IDEAS

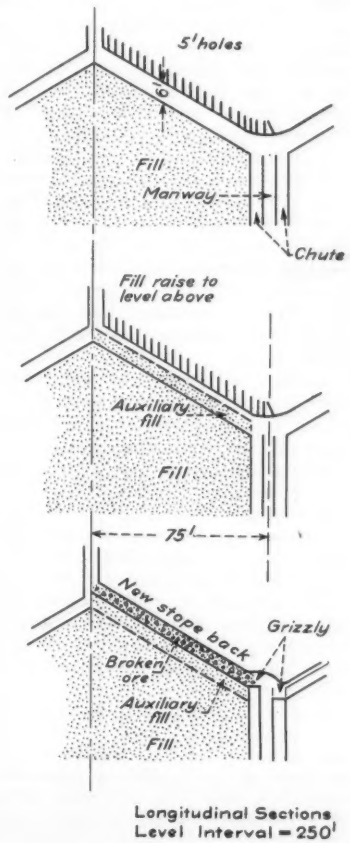
Rill Stoping With Auxiliary Fill

Frank Reinmiller
Bald Eagle Mine, Gustine, Calif.

DURING stoping operations at the San Francisco mine of the Cerro de Pasco Copper Corp., at Morococha, Peru, certain sections of one vein widened to such an extent that mining with ordinary rill stoping methods presented difficulties. In this vein both the hanging wall and the footwall were rather incompetent (loose and slabby) and required stulls set at close intervals. As the vein varied in width from 10 to 25 ft., the placing of such stulls against loose and slabby walls became both difficult and hazardous. Conversion of the rill stopes to square-set stopes was considered but was not regarded with enthusiasm, because of the increased cost entailed. It was thought that the grade of ore in these particular stopes could not bear such additional expense.

So long as the floor-to-back distance did not exceed 5 or 6 ft. the walls would stand fairly well with only occasional stulls. But after blasting 5-ft. holes from apex to grizzly this floor-to-back distance was increased to about 11 ft. It was in this stage of the stoping cycle that the walls proved troublesome. After some study of the problem it was concluded by that keeping the fill closer to the back the additional support afforded thereby would cut down timbering to reasonable proportions. The problem was overcome by introducing another step into the stoping cycle: auxiliary filling of the stope after drilling and loading but before blasting. Thus the cycle became: (1) Stope filled to within 6 ft. of back. (2) Back drilled out from apex to grizzly and holes loaded. (3) Fill stull set and stope filled to within 2 or 3 ft. of back—the auxiliary fill. (4) Holes blasted and stope mucked out.

This auxiliary step enabled us to keep the fill approximately 4 ft. closer to the newly blasted back than is possible in ordinary practice. Timbering was thereby reduced to a minimum and the stopes made safer work places. A disadvantage of this modification is that after blasting the stope is full to the back, which impedes ventilation.

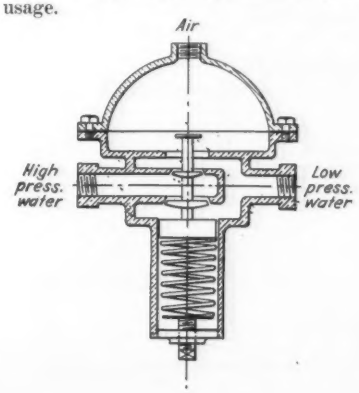


Longitudinal Sections
Level Interval = 250'

▼ ▼ ▼

A Differential Reducing Valve

AT THE Great Boulder Gold Mines, Australia, some trouble was experienced with rock-drill maintenance due to an excessively high water pressure washing the lubricant from the machines, which resulted in unusually high replacement part usage.



Best operating conditions were obtained when water pressure did not exceed 50 percent of the air pressure. But as it was impossible to install boxes for reducing water pressure at points less than 200 ft. above the levels, the following method was adopted to overcome the difficulty:

An ordinary diaphragm-type reducing valve was fitted with a cover connected to the air line so that the working air pressure was applied to the diaphragm. By setting the valve with air pressure at 70 lb. per square inch, so that water pressure was reduced to 35 lb. per square inch, the device maintained approximately 50 percent water pressure throughout the air pressure ranges of from 60 to 90 lb., states Roger J. Burton.

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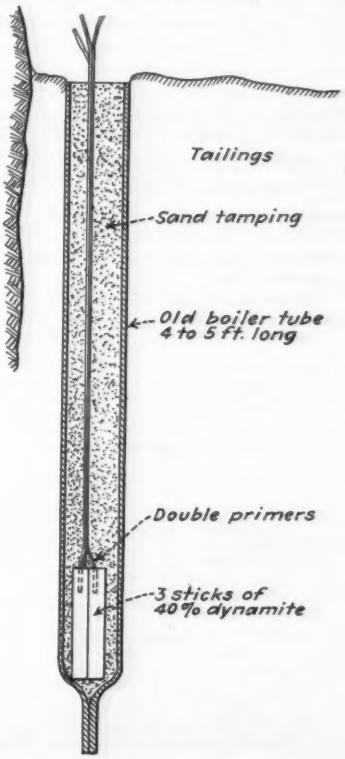
Blasting Stored Mill Tailings

WHEN orders were received to rework accumulated flotation tailings, the chief problem confronting us was how to get the largest possible tonnage to the mill at a low cost and with a minimum consumption of solution or water, writes



Sluicing stored tailings for pumping to Vivian mill

W. T. Ames, superintendent, Vivian Mining Co., Oatman, Ariz. The tailings are in a narrow creek or canyon, a short distance from the 100-ton cyanide mill, and as truck transportation would have involved use of a loading unit and costly construction of a haulage road, it was decided to mine the material by hydraulic methods.

With a limited amount of barren solution and water available, loosening of tailings preliminary to sluicing was found imperative. This was accomplished successfully by the use of the special blasting device or bomb explained in the accompanying illustration. It consists of a piece of old boiler tube from 4 to 5 ft. long, with one end flattened, loaded with three sticks of 40 percent dynamite and tamped with dry sand. Double primers and conventional fuse are used for firing the charge. Each blast breaks or loosens about 300 tons of tailings, which subsequently are sluiced to a wooden, central launder with screen covered openings at 10-ft. intervals leading to the sump. Sluicing is done with a ¾-in. pipe fitted with a ½-in. nozzle at the end of a rubber hose attached to the 2½-in. discharge line of a small centrifugal pump driven by a 7½-hp. motor. A 3-in. Wilfley sand pump actuated by a 50-hp. motor pumps the sluiced tailings to the mill at the rate of 5 tons per hour. The working crew consists of one man, who carries out sluicing and pumping operations according to telephonic instructions from the mill.

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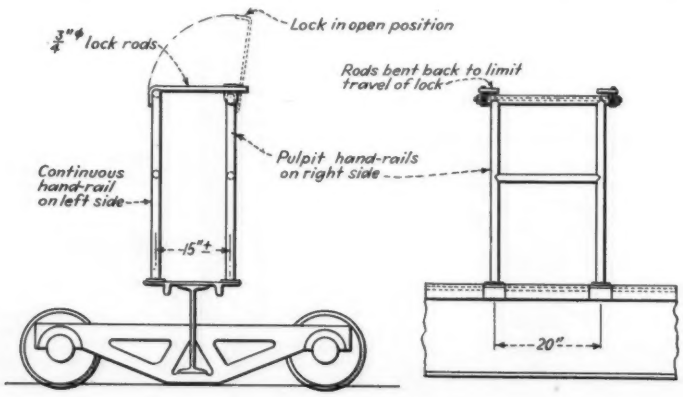
Safety Handrails on Cat Walk of Crane

LIVES AND LIMBS of electricians and cleaners who service lighting over high crane-ways are exposed to considerable danger unless permanent and positive steps are taken to protect them.

The accompanying sketch shows how the Chile Exploration Co. solved this problem over the hand crane-way, at the conveyor drive house of their new secondary plant at Chuquicamata, Chile, states Elwood Stockman.

As shown, the narrow width of the cap channel over the crane beam admits of but one continuous hand-rail. However, an additional "pulpit" hand-rail is mounted on the crane directly under each of the two strings of lights over the crane-way, as shown. A locking device, made of steel rods, pivots through the top rail of the pulpit in such manner that when the electrician stands between the two hand-rails and the lock is lowered into position he is free to stand and reach overhead to his work without danger of falling.

A helper travels the crane by hand from the floor below.



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Kimberly Chute Door

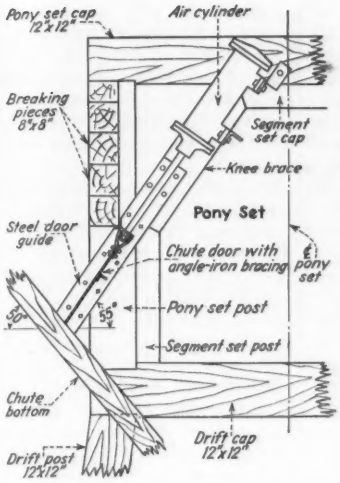
A NUMBER of chute gates, shown in the accompanying sketch, are in use at the Emma-Nevada mine of Consolidated Coppermines Corp., at Kimberly, Nev. These gates were designed and installed by Tell Ertl under the direction of Mark Smith, former mine superintendent, and Frank Bezzie, present mine superintendent. They were built in the mine shop under the direction of Thomas Gilmore, master mechanic.

The parts are pieces that can be found around any mine shop. The main part is the 6-in. diameter air cylinder, with an allowable stroke of 22 in. All other parts are made of ½-in. sheet steel and are either lagscrewed or bolted to the pony-set timbers. Each door must be individually designed (a job which requires only a few hours), because the dimensions of the pony set and the inclination of the chute bottom always vary a few inches. As all breaking pieces on chute lips in the mine allow at least 19 in. clearance, one of the problems this inclined chute door meets and solves is to allow more than that clearance for ore passage when the door is open. A vertical door does not allow the required opening unless a stroke of at least 30 in. is employed, but a stroke of 22 in. is sufficient for the inclined door.

Another advantage of this chute door is that two such doors can be placed on opposite sides of the same pony set. A third advantage is that it can be installed without altering the size or design of the pony set.

The chute bottoms at the Emma-Nevada are placed at an angle of approximately 50 deg. from the horizontal. Placing of the chute door was tried variously at angles of 45, 55, and 65 deg., and all these angles worked well, but the angle of 55 deg., as shown, was finally chosen as standard.

Doors are operated by a four-way valve which forces them to close as well as to open. This feature allows the cars to be loaded to maximum capacity without fear of spills. Also, the rapid and powerful action of the



Diagrammatic detail of construction and parts of chute door

doors causes any obstructing timbers or boulders to be disposed of with a minimum of trouble. These doors have successfully passed many hundred thousand tons of dry and wet, fine and coarse, cave mining ores, with no undue trouble. With proper placement of the valve lever this door may be operated from any desired position.

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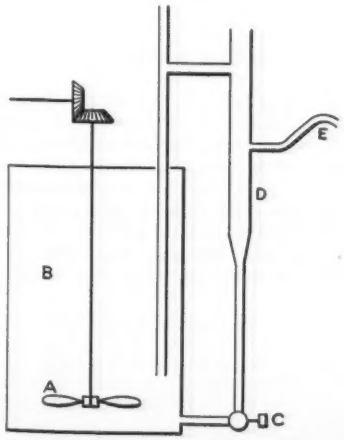
Feeding a Filter Aid

DIATOMACEOUS earth has come increasingly into use to coat the filter medium in filter press or bags. This is termed precoating. The quantity added to the clarifying leaves and bags may vary from 5 to 20 lb. a day. The usual procedure is to throw a handful into the clarifying tank and spread some on the zinc-dust belt.

To feed this material into clarifying tank in an even flow so that all the leaves are coated, the apparatus shown in the accompanying illustration has been devised and has proved efficient, according to Algernon Del Mar, 4524 Alpha St., Los Angeles, Calif. The celite emulsion is kept in suspension by the paddle *A* in the barrel *B*. A small centrifugal pump *C* keeps the emulsion circulating through a 6-in. pipe, *D*. The amount of the emulsion used depends upon the height of the discharge of the hose *E*. The centrifugal pump should be made of steel, inasmuch as the celite is abrasive. The barrel can be filled again when empty.



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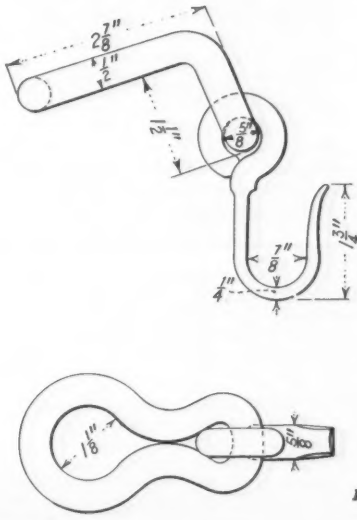
Simple Holder For Jackhammers

A SIMPLE DRILL auxiliary that has speeded up drilling of horizontal holes with jackhammers is being used successfully at the Ground Hog unit of American Smelting & Refining Co., Vanadium, N. M. As shown in the accompanying self-explanatory sketch, the drill holder consists of a loop resembling a figure 8, with one end bent at an angle slightly more than 90 deg., and a small hook. Both units are forged from ½-in. round iron.

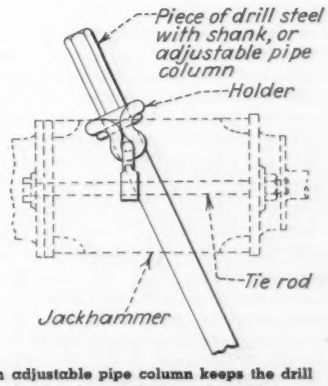
Adjustment and operation are very simple. The operator slips the loop onto the shank end of a long piece of drill steel, attaches the hook to the tie rod of the jackhammer, and then commences drilling. Periodic changing of the drill steel position during drilling can be avoided by using an adjustable pipe column fitted with a feedscrew to keep the drill in the desired horizontal position. When using a jackhammer with hidden tie rods, a simple clamp is used in place of the hook.



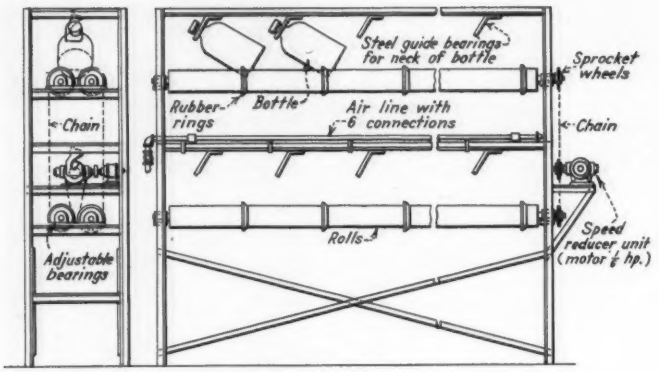
The drillholder consists of a loop of ½-in. round iron resembling a figure 8

A Laboratory Agitating Machine

ONE of the most important auxiliary units at mills handling custom ores is the laboratory. In order that methods of treatment and other pertinent data may be determined quickly and accurately, laboratory machinery should be designed and laid out to make possible multiple test runs. A piece of equipment that has given excellent results at the laboratory at the Pilgrim property of Producers Mines, Inc., near Chloride, Ariz., is the agitating machine explained in the accompanying illustration. Here, a 250-ton cyanide mill handles ores shipped by 25 or more producers, making employ-



An adjustable pipe column keeps the drill in the desired horizontal position



Laboratory machine for agitating pulp samples

ment of such equipment almost obligatory. As will be seen, the machine is of relative simple design, scrap materials being used in its construction. It consists of a sturdy, all-welded, steel frame made from angle irons, four light rollers with appropriate end bearings and rubber rings to prevent slippage of the bottles to be agitated, twelve steel guide bearings in which rest the necks of the bottles, and an air line containing six individual connections for air agitation. The rolls are actuated through a chain drive by a small speed-reducer unit driven by a ⅙-hp. motor. As built, twelve tests can be run at one time, and each bottle can be placed on the rolls or removed therefrom without first stopping the drive unit.

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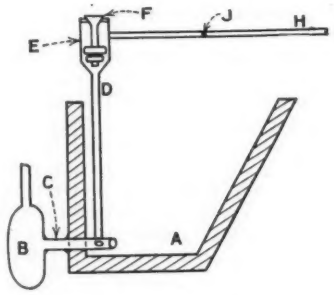
Pump Control Device

WHEN a centrifugal pump is to handle a coarse, high-gravity pulp such as the discharge from a rod or a ball mill, difficulties are some times experienced in maintaining a steady head in the pump suction box, causing surges at the pump discharge. The usual method of overcoming this difficulty was to take atmospheric air into the pump suction pipe. The air was drawn into the pump by the moving pulp stream, but this method of supplying air to the pump does not always work, especially when the velocity through the pump suction pipe is low. In such cases it has been found that a more positive regulation of the pump can be obtained by having the controlling air slightly above that of the atmosphere. A device with that objective in view was introduced at one of the Canadian gold mines by C. W. Dowsett and has been found to give satisfactory results, writes Henry Hanson, of Toronto, Canada.

With a pulp of 1.94 specific gravity and the pulp level standing at 12 in. above the bottom of the air pipe attached to the pump suction, the air pressure required to overcome the column of pulp will be about 0.84 lb. per square inch and with 18 in. submergence about 1.26-lb. pressure. Assuming that the pulp level required to be maintained is a height of 16 in. above the lower end of the air pipe, the air pressure in the air pipe must therefore be maintained at a pressure



slightly higher than that required to overcome the pulp column, which in the above instance would be approximately 1.12-lb. pressure.

In the accompanying sketch *A* is the pump suction box, *B* is the pump, *C* the pump suction pipe, *D* the air pipe to the pump suction, *E* the valve chamber, *F* the air pressure control valve, *H* low-pressure air line, *J* air volume control valve.

The pressure on air supply line should be reduced to 4 or 5 lb., as the low pressure is more easily controlled at valve *J* than is a higher pressure. The air allowed to pass through valve *J* should not be enough to cause pump to lose suction.

The air pressure in valve chamber *E* is governed by valve *F*, which has a rubber seat and is weighted down to blow off at the desired pressure, depending on the height of the pulp column in the suction box found most desirable to maintain. If the pulp level in the suction box is raised to a height of, say, more than 18 in., the air to the pump suction would cut off and escape through valve *F*. On the other hand if the pulp column in the suction box was reduced to 16 in., the air escape at valve *F* would stop and the air to pump suction would automatically cut in, to supply it in sufficient volume to maintain fairly stable conditions of the pulp level in the suction box.

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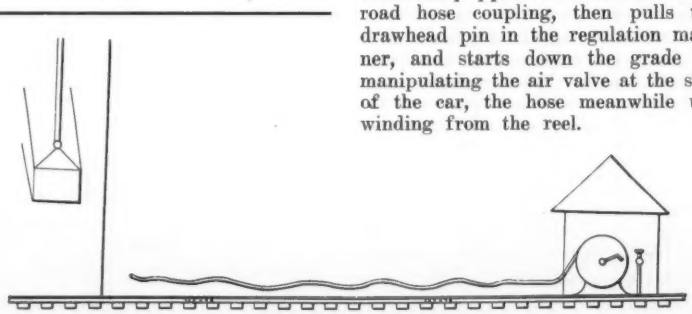
Car Spotting By Compressed Air

THE OLD METHOD of spotting empties under storage bins and shaft chutes, by gravity and cumbersome hand brakes, may be greatly improved by employing compressed air as in regular train service, states P. C. Ziemke, Milwaukee, Wis. As a rule the hand-brake rigging is stiff and difficult to operate, due to the fact that this equipment is used infrequently. The air system is in constant use and therefore in good operating order.

Several large operators have equipped their spotting tracks with air apparatus, permitting the spotter almost the same ease of operation as enjoyed by the engineer at the throttle. This they accomplished by piping a 2-in. air main to the yard and terminating it in a small shanty that houses the hydrant, a reel of sufficient size to accommodate 100 ft. of good hose, and a small motor to power the reel for rewinding the hose for the next trip.

By this method the spotter couples the hose end to the car's air hose, which is equipped with a standard railroad hose coupling, then pulls the drawhead pin in the regulation manner, and starts down the grade by manipulating the air valve at the side of the car, the hose meanwhile unwinding from the reel.



PERSONAL ITEMS

H. E. Collin has become Government Mining Engineer at Gwelo, Southern Rhodesia.

A. E. Stanton has been elected vice-president of American Zinc, Lead & Smelting Co.

K. M. Hannah recently joined the metallurgical staff of Takuapa Valley Tin Dredging, Ltd., in West Thailand.

Scott Turner, who recently spent three weeks in the Province of Saskatchewan, has just returned to his New York office.

H. W. Straley, III, has returned to Waco, Tex., after spending two months in the east for the Eastern Exploration Co.

G. G. Campbell was recently appointed superintendent of Preston East Dome Mines, operating a property in Ontario, Canada.

H. W. C. Prommel, consulting geologist and mining engineer, of Denver, Colo., recently left for Mexico City on a business trip.

John M. Davis, formerly with Denver Equipment Co., 50 Church St., New York, is now with the Phosphate Mining Co. at Nichols, Fla.

Byron C. Elsley has resigned his position with the Balatoc Mining Co. to become chief geologist with the Itogon Mining Co., Baguio, P. I.

Edward H. Wisser, consulting mining geologist, has left San Francisco, Calif., for Contra Estaca, Sinaloa, Mexico, on professional business.

L. K. Fletcher, prominent in Canadian mining circles, has been made a director of Lamaque Gold Mines, Ltd., succeeding George C. Miller, deceased.

Dr. Robert D. Butler has completed his summer geological work for the London Mining & Milling Co. and has returned to Lehigh University.

John P. Skinner, formerly with the London Mining & Milling Co., at Alma, Colo., is now employed with the Climax Molybdenum Company, Colorado.

F. S. Turneaure, mining geologist with Oliver Iron Mining Co. for some years, recently resigned from that connection to engage in research work at Harvard University.

Prof. Robert S. Lewis, of the University of Utah, has returned to the University after spending part of the summer in various mining districts in Oregon and Washington.

J. H. Edwards, electrical editor, *Engineering and Mining Journal*, has been reappointed a member of the committee on industrial power applications, American Institute of Electrical Engineers.

M. S. Lougheed of Vancouver, B. C., formerly assistant geologist on the staff of Siscoe Gold (Quebec), has returned to Princeton University to obtain his Ph. D. degree.

John L. Spielman, assistant research engineer at the reduction works of Anaconda Copper Mining Co., at Anaconda, Mont., has been appointed professor of

JOHN L. SPIELMAN

metallurgy at the Montana School of Mines, at Butte. Mr. Spielman succeeds **Dr. Curtis L. Wilson** in that position. In his position at the Anaconda reduction works he has been active in manganese experimental work as well as in phosphate and acid research. A resident of Anaconda for many years, he is a native of North Dakota. He graduated in metallurgy in 1928 from the North Dakota State College at Fargo. His predecessor, Dr. Wilson, become dean of the School of Mines at Rollo, Mo., the past summer.

Robert D. Mueller and **S. P. Tracy,** California dredging operators, are testing placer properties in the Similkameen district.

L. E. Putnam has become manager of Riverside mine in Alaska, a property of the J. H. Scott Co. of San Francisco. He was formerly manager of Atolia Mining Co., Randsburg Calif.

William L. Honnold has provided funds for furnishing a lounge room at Douglass Houghton Hall at Michigan College of Mining and Technology. Mr. Honnold is a distinguished alumnus of the college.

Naaman H. Keyser, a June graduate of Antioch College, has joined the research staff at Battelle Memorial Institute, Columbus, Ohio, and has been assigned to metallurgical research. He is a member of the American Society for Metals.

A. A. Gustafson, engineer in charge of Western operations of the Freeport Sulphur Co., has returned to his Reno, Nev., office from a visit with relatives in Duluth.

Tell Ertl recently returned from Bolivia following completion of a trip examining mining properties for International Mining Co., La Paz, Bolivia. Mr. Ertl is a lecturer in mining at Columbia University.

Patrick J. Ryan, mining engineer, formerly manager for Eldorado Gold Mines, Ltd., is supervising diamond drilling of the Gunflint iron range of Ontario for a syndicate of investors.

O. H. Metzger, United States Bureau of Mines district engineer at the Nevada station in Reno, is reported to have been assigned to investigate and report on cinnabar deposits in a number of Nevada districts.

M. T. Hoster, who has been consulting engineer for E. & G. Brooke Iron Co., of Birdsboro, Pa., has been placed in charge of operations at the Richard iron mine near Dover, N. J., which has recently been taken over by the aforesaid company.

Frank X. Banz, smelter superintendent for the Chile Exploration Co. at Chuquicamata, Chile, for the past 22 years, has resigned and is expected to arrive in the States the latter part of October. He will reside at 2806 Southern Avenue, Baltimore, Md., for the present.

Col. W. H. Lanagan, consulting engineer for the Natomas Company, returned lately to his office at Sacramento, Calif., from Manhattan, Nev., where he inspected bucket-line dredging operations of the Manhattan Gold Dredging Co., conducted by Natomas engineers.

Dr. George C. Branner, State Geologist for Arkansas, left Little Rock on Sept. 24 for Washington, D. C., to attend a meeting of State mine coordinators at the Office of Production Management. Dr. Branner was recently appointed emergency coordinator of mines by Governor Homer Adkins.

Ward F. Simmons, metallurgical engineer, has joined the technical staff of Battelle Memorial Institute, Columbus, Ohio. Prior to joining Battelle he was associated with the American Steel and Wire Company, Duluth, Minn. Mr. Simmons was graduated from the School of Mines and Metallurgy of the University of Minnesota.

B. C. Burgess, author of the article on "Topaz" in *E.&M.J.* for September, writes in to say that, since the article was written, development work has shown a reserve of approximately 60,000 tons. He also states that the old stamp-mill site is on Little Fork Creek, not on Lynch's River, and that in the tests the permanent expansion during the calcination was 0.75 percent, not 9.75 percent.

Stanley Trengove, assistant superintendent for the Oliver Iron Mining Co., of the Hibbing and Chisholm district, Mesabi range, resigned the first of September to take over new duties as instructor and head of the Missouri School of Mines and Metallurgy, Rolla, Mo. Before coming to the Mesabi Range several years ago, Mr. Trengove was an

instructor at the School of Mines and Metallurgy, University of Minnesota.

H. Foster Bain, mining consultant for the Philippine Government, on his recent return from Washington to the Islands stopped over at Reno to visit with **James O. Greenan.**

Frederick H. Dakin, Jr., ore purchaser for the Texas Mining & Smelting Co., of Laredo, Tex., has bought several lots of antimony ore in Nevada, nearly all stibnite, for shipment to the Laredo smelter.

Dr. Otto Sussman, chairman of the board of the American Metal Co., Ltd., and a director of the Consolidated Coppermines Corporation, spent a fortnight recently at the latter company's Kimberly, Nev., properties.

W. J. Loring, manager for the Madre de Oro Gold Mines Inc., completing a 350-ton flotation mill at the Church mine, near Eldorado, Calif., lately visited the Comstock lode at Virginia City, Nev., in connection with interests he retains there.

James Hopkins, recently returned from the Philippine Islands, has been appointed chief mining engineer in charge of all operations for the Reynolds Metals Co. in Arkansas. His address is Reynolds Mining Corp., Boyle Building, Little Rock, Ark.

H. J. Huester, of the staff of the Reynolds Metal Co., and formerly a lieutenant commander in the United States Navy, has been appointed coordinator of defense production for the aviation industry. He will make his headquarters in Washington, D. C.

D. E. Renshaw, mining section, industrial engineering department, Westinghouse Electric & Manufacturing Co., East Pittsburgh, has been reappointed a member of the committee on industrial power applications, American Institute of Electrical Engineers.

Al G. Muller, mining engineer, who had been with the M. A. Hanna Co. at Iron River, Mich., for the past 18 months, recently came to New York State to act as engineer of the Clifton Ore Co., a Hanna subsidiary.

Samuel I. Bowditch, recently with the Benguet Consolidated Mining Co., at Baguio, P. I., left the Philippines recently to accept a position as geologist with the Bauxite Mining Corp., a subsidiary of Reynolds Metal Co., at Little Rock, Ark.

H. I. Altshuler, who is at La Paz, Bolivia, has been acting since last June as special representative of the Federal Loan Agency for the Metals Reserve Co. and the Defense Supplies Corp. in Bolivia. He is also busy mining tungsten and is bringing the Romana enterprises up to an appreciable production.

Bertrand A. Landry has joined the staff of Battelle Memorial Institute, Columbus, Ohio, where he is engaged in research and developmental work in the division of fuels research. Mr. Landry is well known in the field of fuels research for his investigations and publications on the principles of combustion, the distillation of oil shales, the theory of sampling, and the chemical treatment of fuels.

James B. Christie has joined the Charles Hardy organizations and will be in charge of all research and development. Mr. Christie has been connected with powder metallurgy for the past ten years, and before that was associated with Anaconda subsidiaries in Chile. He holds the degrees of B.S. in metallurgy from the University of California and LL.B. from Fordham University.

C. W. Nicolson, of Miami, Okla., manager of the Beck Mining Co. since the spring of 1939, recently resigned to accept a position as manager of the North Range Mining Co. at Negaunee, Mich. He was succeeded by **R. H. Beck,** of Miami, who has been active in a supervisory capacity in the Beck company for several years. Young Beck is a son of Charles A. Beck, of Miami, president of the Beck company.

John J. V. Forbes has been appointed supervising engineer of the safety division, U. S. Bureau of Mines. The mine inspection and investigation work which Mr. Forbes will supervise will be lodged in a new division created by the Bureau's health and safety branch, which is headed by Dan Harrington. Mr. Forbes brings to his new post about 30 years' experience as a mining engineer and an exponent of mine safety.

Carl J. Trauerman, who retired recently as president of the Mining Association of Montana, after leading the group since its organization seven years ago, was elected secretary-manager, a newly created office, at the seventh annual convention at Silver Gate. **Anthony Strojan, Jr.,** Helena, Mont., succeeds Mr. Trauerman as president of the Association. **Dr. Francis A. Thomson,** president of the Montana School of Mines, was named chairman of the executive committee.

Robert E. McConnell has been named as chairman of the newly organized Engineers' Defense Board, composed of five representatives each of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, Society of Automotive Engineers, and the American Institute of Chemical Engineers. Representing the A.I.M.E. on the Board are: John F. Thompson, executive vice president, International Nickel Co.; Zay Jeffries, technical director, lamp department, General Electric Co.; Wilber Judson, vice president, Texas Gulf Sulphur Co.; Frederick Laist, metallurgical manager, Anaconda Copper Mining Co.; Wilfred Sykes, president, Inland Steel Co. Dr. Harry Rogers, president of Brooklyn Polytechnic Institute, is vice chairman of the board and A. B. Parsons is secretary.

Dr. Champion H. Mathewson, internationally known metallurgist and head of the department of metallurgy at Yale University, was honored by the 115 members of the Yale Metallurgical Alumni on Friday and Saturday, Oct. 3 and 4. At a dinner held Friday evening in New Haven, Conn., he was presented with a commemoratory volume prepared for the occasion by his former students in honor of his 60th birthday on Oct. 7. This volume of 215 pages contains 19 technical papers on physical metallurgy written for the occasion by graduates of the department of metallurgy at Yale. The book also contains an appreciation written by Dr. Zay Jeffries, a biography written by Prof. Arthur Phillips of Yale, and a history of the department of metallurgy at Yale. Present at the dinner were Charles Seymour, president of Yale University, and Deans Furniss, Warren, and Dudley of the Graduate School, Sheffield Scientific School, and the School of Engineering, as well as members of the alumni group.

Thomas R. Leighton, a member and director of the School of Engineering of the University of Chile and a graduate mining engineer of Lehigh University, recently came to the United States to receive the honorary degree of doctor of engineering at Lehigh's 75th anniversary celebration, Oct. 3, 4 and 5. The degree was presented by **"Skipper" Howard Eckfeldt,** long professor of mining at Lehigh and Professor Leighton's former teacher. Mr. Leighton is a graduate civil engineer of the University of Chile, Before entering Lehigh in 1920, he was employed by various American mining companies in Chile—more particularly by the Braden Copper Co. He obtained his E. M. degree at Lehigh in 1921. Upon graduation he immediately went into the employ of the Bethlehem Mines Corp. In 1922, he became assistant manager of the Sun Development Co., in Bueycito, Cuba, an American manganese producer, under **J. R. Van Fleet.** He remained there until 1926, when he returned to his native Chile. Then followed various professional engagements as a consultant, after which he became connected with his Chilean Alma Mater as professor of mining and metallurgy, succeeding the late Berthold Koerting. Since 1931, he has been director of the School of Engineering at that institution, which now has more than 500 students taking engineering courses. Professor Leighton came to the States by plane via the East Coast, and stopped over at Buenos Aires, Rio de Janeiro, and other South American capitals in the interest of the first Pan American Congress of Mining Engineering and Geology, to be held in Santiago Jan. 11-20, 1942, with which he is connected in an official capacity.

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OBITUARY

William J. Keese, technical supervisor for the Hercules Powder Company at Virginia, Minn., died Aug. 31.

Alexander M. McDonald, formerly active in Utah mining circles, died in Seattle, Wash., on Sept. 20. He was 58.

Harold Chase Buckminster, a retired mining man and industrialist, died at Malden, Mass., on Sept. 27. His age was 67.

Pavel Stepanovich Nazaroff, consulting mining engineer of Johannesburg, South Africa, died recently in that city. He was 65.

Norman Ernest Giblin, long associated with mining in New South Wales, Ma-

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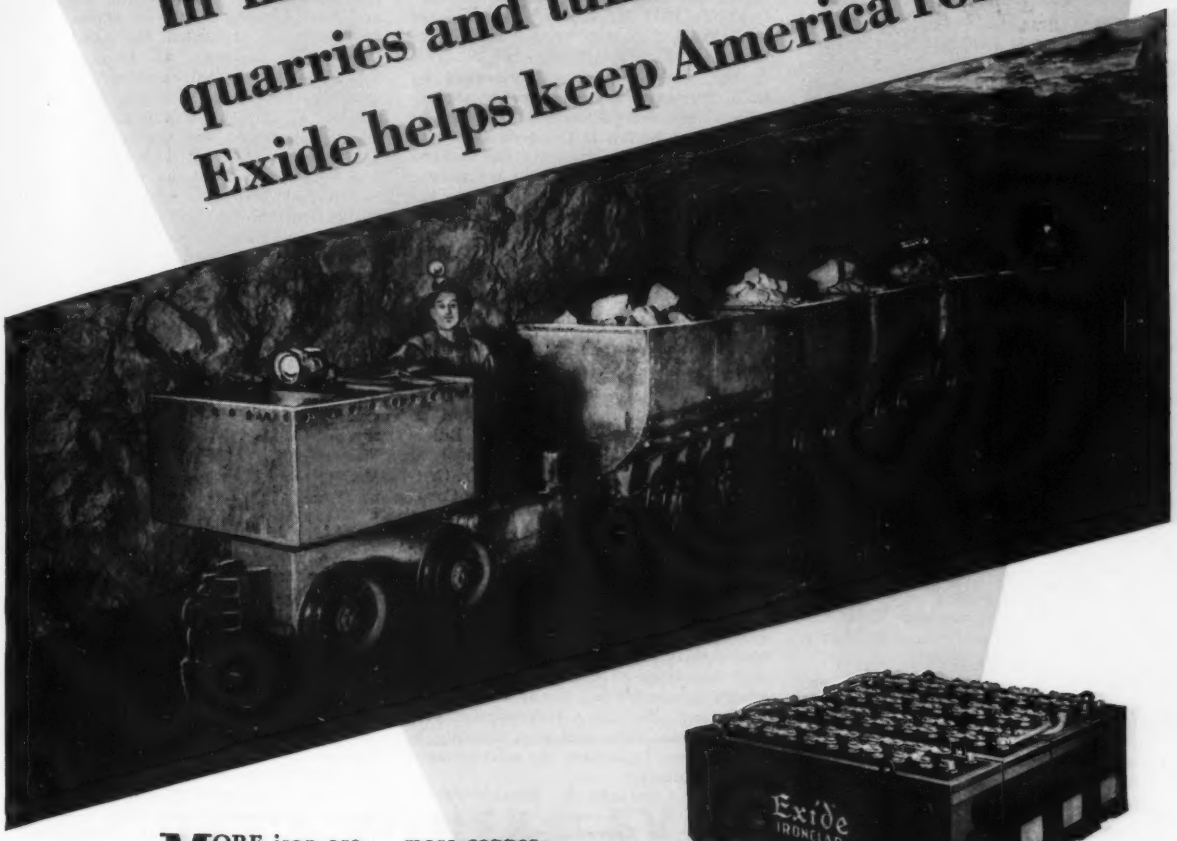

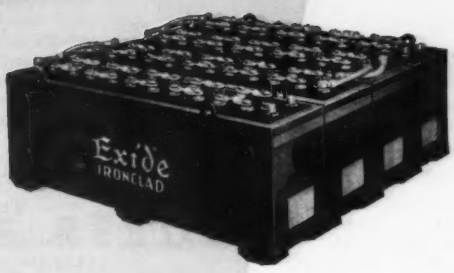

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Exide IRONCLAD BATTERIES

laya, and South Africa, died recently at Roseberry, Tasmania.

William Gardner Rice, publisher of the *Houghton Daily Mining Gazette,* at Houghton, Mich., and of the *Calumet Evening News Journal,* died at Houghton on Sept. 4 at the age of 71.

Edward Franklin Pelton, who before his retirement in 1940 had been superintendent of mines and geologist for the Phelps Dodge Corp., as well as prominent as an industrialist, died at Uplands, Calif., on Sept. 26. He was 64.

Homer P. Chandler, long affiliated with Ohio Brass Co. as development engineer of the company's mining department at Mansfield, Ohio, died on Sept. 3 at the age of 63. Mr. Chandler went to Mansfield in 1921 from Pulaski, W. Va., where he was chief engineer of mines and furnaces of the Pulaski Iron Co.

H. E. ("Red") Ostin, sales representative for *Engineering and Mining Journal* and *Coal Age* in the Chicago territory, died suddenly on Sept. 20 of a heart attack. He joined the McGraw-Hill Publishing Co. Dec. 1, 1927, as a member of the advertising staff of *Factory,* being transferred to the mining papers eight years later.

E. L. Wallower, capitalist, philanthropist, and industrialist, a pioneer in the development of the Joplin, Mo., district, who with his three sons was for 21 years active in the operation of mines in the Webb City, Cartersville, and Duenweg districts of Missouri, and the Picher-Oklahoma field, died on Sept. 9 in Harrisburg, Pa., at the age of 87.

Frank C. Burgess, geologist, 41, was among the five persons killed in an airplane crash on Sept. 27, when flying from Tipuani to La Paz, Bolivia. Mr. Burgess was a graduate of the New Mexico School of Mines, 1923, and had been formerly employed by Cia. Minera de Peñoles, American Smelting & Refining Co. in Mexico, and Anglo-Chilean Nitrate Corp., in Chile. At the time of his death he was employed as geologist, since May, 1939, by the Cia. Aramayo des Mines en Bolivia.

George Samuel Embury, general superintendent of mills for Compañia de Real del Monte y Pachuca, died on Aug. 28, 1941, at Pachuca, Hgo., Mexico, at the age of 65. Mr. Embury was born in San Francisco, Calif., and educated in the Berkeley public schools. He worked in mills in Alaska from 1895 to 1906, when he entered the employ of Cananea Consolidated Copper Co. in Mexico. Leaving Cananea in 1907 he became mill superintendent at Guanajuato Consolidated. In 1911 Mr. Embury joined the Compañia de Real del Monte y Pachuca as superintendent of the Loreto mill, later advancing to the post of general superintendent of mills and all company metallurgical operations.

Frank W. Griffin, well-known San Francisco dredge operator and consulting engineer for the International Mining Corporation of New York, died in San Francisco, Calif., on Sept. 5, at the age of 68.

An Appreciation

Frank W. Griffin was born in the romantically historic town of Weaverville, Calif., on June 20, 1873. His early education was acquired in the schools of California, and later completed at Harvard University, from which he was graduated in 1896. After his graduation he returned to California and became interested in the gold-dredging industry, being connected during 1898 and 1899 with the Risdon Iron Works in the building of the first gold dredges at Oroville, Calif. In 1901, Mr. Griffin was associated with D. P. Cameron in the building of the original Indiana Dredge No. 1. This dredge was designed and managed by O. B. Perry and was constructed at Oroville. Upon completion of this dredge he formed the Griffin & Cameron Co., with the purpose of constructing the Indiana type dredge. In 1902, Griffin & Cameron Co. was reorganized and became the Western Engineering & Construction Co., consisting of O. B. Perry, D. P. Cameron, F. W. Griffin, and M. E. Griffin. This company built more than 30 dredges, which operated in Alaska and California. With a group of associates Mr. Griffin formed in 1907 the Natomas Consolidated Gold Dredging Co. of California, and was subsequently its president. A few years later he became associated with Placer Development, Ltd., Pato Consolidated Gold Dredging, Ltd., Bulolo Gold Dredging, Ltd., and other subsidiaries as a director. During 1939 Mr. Griffin joined the International Mining Corp., of New York, as a consulting engineer, and moved his residence to New York City. In late August and early September of 1941 he made a combined business and pleasure trip to San Francisco, and it was while on this trip that he suffered a severe heart attack and passed away very suddenly. Each of his many friends and associates of the gold-dredging industry mourn his passing as a truly personal loss. He was a very popular person to work with, and was untiring in his endeavor to further the advancement of the industry.

CHARLES M. ROMANOWITZ

An Appreciation of Thomas Moore Hamilton

Thomas Moore Hamilton died in Los Angeles on Sept. 5, at the age of 68 years. He was born at Helena, Mont. His early years were passed in Fergus County, where his father and grandfather, James Fergus, were pioneers with extensive interests in lands and cattle. He rode the range with Charles Russell, the cowboy artist. In 1895, he came into the laboratory of Braden Brothers, in Helena, to learn assaying and then decided to get an engineering education. He attended the Rensselaer Polytechnic Institute, at Troy, N. Y., for one year, and then was three years at the Massachusetts Institute of Technology, at Boston, in a mining course. During vacations, he was occupied in field work in the United States, Canada, and Mexico. In 1904, he went to Chile as superintendent of the Braden Copper Co. In 1910, he took charge of the Santa Francisca and Charcas units of the American Smelting & Refining Co. in Mexico. In 1913, he returned to South America as general superintendent of the Andes Exploration Co., until 1918, when he returned to his home in Montana. He later took charge of a large party making a geological study of the Eastern Bolivian petroleum fields, and examination of tin mines in that country. In 1922, Mr. Hamilton married Marguerite C. Cross, of Lewistown, Mont., who with their son, Thomas, survives him. He then made his home in Southern California. In 1930, he accompanied William Braden to South America, examining mining resources in Brazil and Peru for two years. Returning to Los Angeles, he continued to examine mines for clients in Southwestern United States and Mexico. Since 1936, up to his death, he had been associated with William Braden in exploration work throughout Western United States. "Tom" Hamilton was a Mason, an active Rotarian, a member of the Los Angeles Chamber of Commerce, the Mining Association of the Southwest, the American Institute of Mining and Metallurgical Engineers, the Alumni Association of the Massachusetts Institute of Technology, and the Chi Phi Fraternity. His many friends valued his wide experience, his sound counsel, and ready sympathy, and will miss his genial and kindly personality.

WILLIAM BRADEN

▼ ▼ ▼

A LETTER

Reverberatory Capacity at Noranda

The Editor:

I HAVE JUST COMPLETED reading the Diamond Jubilee Number of *Engineering and Mining Journal* and think it is a very fine issue and your organization and staff are to be congratulated on getting out such an outstanding number in a mining and technical magazine.

We are particularly interested in Prof. Carle R. Hayward's short article under "Pyrometallurgy," especially the last sentence of his "In Retrospect." That sentence reads: "The little intermittent reverberatories treating 10 to 15 tons grew slowly, then rapidly after fuel oil and pulverized coal became available, up to 800 tons of solid charge per furnace-day." In our article presented at the annual meeting of the Canadian Institute of Mining and Metallurgy in March, 1939, you will note that in 1929 the tons of solid charge per furnace-day at Noranda was 871 for the whole year and it has gone up gradually until in 1938 it was 1,445 tons of solid charge per furnace-day for the whole year. In 1939 and 1940, it was slightly higher, and this year it will probably be above 1,500 tons of solid charge per furnace-day. Some days we smelt 1,600 tons of solid charge, and with changes we are now making we expect to go higher.

W. B. BOGGS

Noranda, Quebec, Canada

TODAY'S MINERS EVERYWHERE ARE ENJOYING THE RESULT!

"Nature cannot withhold the secret of a good non-acid storage battery—if a really earnest hunt for it is made."

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This was the storage battery that first made possible *safe and dependable electric light* for the individual miner—the unique power-source which today provides the Edison Electric Cap Lamp's *high-level* illumination, unfailing throughout the shift, for more than 450,000 coal and metal miners the world around . . . creating the strongest, sturdiest, most effective safety cap lamp ever developed—EDISON in every unequalled quality of productive service over many long years of life.

Upon request, we will be glad to arrange an actual demonstration of the new Model "P" Edison Electric Cap Lamp on-the-job in your mine. No obligation of any kind—naturally.

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M. S. A. Products include: Breathing Apparatus . . . Inhalators . . . Approved Dust Respirators . . . Masks of all types . . . Gas Indicators . . . Gas Detectors . . . Safety Goggles . . . Protective Hats and Caps . . . Edison Electric Cap Lamps . . . Safety Belts . . . Safety Clothing . . . Dust Instruments . . . First Aid Equipment. Descriptive Bulletins will be sent on request.

NEW BOOKS

MINERALS YEARBOOK, REVIEW OF 1940. *United States Bureau of Mines. Prepared under the direction of E. W. Pehrson, chief, Economics and Statistics Branch. H. D. Keiser, editor. Pp. 1459. For sale by Superintendent of Documents, Washington, D. C. Price $2 (cloth).*

THIS VOLUME IS OF VALUE not only as the "official" reference work and statistical record of the mineral industries but because of its comprehensiveness, coupled with the speed with which it is produced. Each year, we believe, it has shown some improvement over the year before, although it has been an excellent work from the year of its first appearance. In a foreword presenting the new edition, Dr. R. R. Sayers, director of the Bureau of Mines, states that the Bureau has sought to record the highlights of the defense program as it affected the mineral industries. Much information not previously available, he says, is contained in the current volume.

Previous volumes have been presented as having been compiled under the supervision of H. Herbert Hughes. The title page of the new volume indicates that H. D. Keiser is now editor. Mr. Keiser explains that adoption of a publishing plan has made it possible to issue preprints of every chapter and to produce the volume itself at an earlier date than in recent years.

The Yearbook achieves its coverage of the entire field in 72 chapters, each prepared by a specialist.

PRODUCTION POSSIBILITIES OF THE MARGINAL COPPER MINES IN ARIZONA. *A report to Leon Henderson, director of Office of Price Administration and Civilian Supply, prepared by the Arizona Department of Mineral Resources, at Phoenix, at request of Arizona Copper Tariff Board. Pp. 103.*

THIS SURVEY states that an increase in the price of copper to 14c. a pound could result in an additional production of 55,000,000 lb. of copper yearly by small mines in Arizona (85,000,000 lb., if Inspiration Consolidated Copper Co., a major producer, were included), provided a return of the necessary capital investment can be guaranteed. The capital expenditure required for the 85,000,000 lb. is put at approximately $3,000,000, including $500,000 for rehabilitating the Inspiration mill. A 16c. price would bring out 32,000,000 lb. more, requiring an expenditure of $1,000,000.

Twenty-seven mines, in addition to Inspiration, are included in the major group that, it is asserted, would yield the increase. These are described in some detail. They are the Abe Lincoln, Bagdad, Blue Bell, Boggs, Bunker Hill, Calvillo, Carlota, Christmas, Control group (including two mines), Copper Bell, Copper Group, Dundee-Arizona, Hackberry, Hartman-Homestake, Kay, Keystone, Lone Pine, Mountain Copper, Piedmont, Pontotoc, Savanic, Shattuck shaft (of Shattuck-Denn), Squaw Peak, Storm Cloud, Tout, Twin Buttes, and Van Dyke. Besides this group, 20 other "promising copper prospects" are cited, with brief descriptions.

Many questions are obviously involved in any consideration of the proposal made by the Arizona Department of Mineral Resources. All having the interest of the mining industry at heart would surely be cheered to see the small mines brought into production on any reasonable stable basis.

THE MINING OF GEMS AND ORNAMENTAL STONES BY AMERICAN INDIANS. *By Sydney H. Ball. Anthropological Paper No. 13, Bulletin 128, Bureau of American Ethnology, Smithsonian Institution, Washington, D. C. Pp. 77, plus two folded inserts and three halftone plates. No price is quoted, indicating free distribution.*

IN THIS SCHOLARLY PAPER on so fascinating a subject Mr. Ball deals with not fewer than 84 ornamental stones and gems and the extent and manner of their production and use by the aborigines of the Americas from Alaska to Cape Horn. In citing the sources known to him from which the Indians obtained gems and ornamental stones he lists 289 mines that they operated. In pages 1 to 19, he discusses the Indian as a geologist and mineralogist and as a prospector, his mining methods, his knowledge of commercial chemistry, the effect of his mining on the commercial conquest of America, and, actually, the Indian's mining laws. The remainder of the bulletin is devoted to the gems and stones themselves, each one by itself. To cite the numerous intriguing references would take excessive space. The reviewer confesses to sharing the primitive love of color and beauty in mineral specimens, which the Indian is shown to possess.

FORTUNES IN MINERALS. *By Ion L. Idriess. Published by Angus & Robertson, Limited, 89 Castlereagh St., New South Wales, Australia. Pp. 128. Price $2.50.*

PUBLISHED on the other side of the globe, this book is intended for the Australian prospector who knows neither chemistry nor mineralogy. A desire to help thus indirectly in supplying his country with needed minerals evidently actuates the author. The style is simple and popular. The text is devoid of illustrations. In the closing chapter a tabulation of solvents and reagents for fusion is presented.

LADY SOURDOUGH. *By Frances Ella Fitz, as told to Jerome Odlum. The Macmillan Company, New York. Illustrated. Pages 319. Price $3.*

PRESENTED as the autobiography of a "Manhattan stenographer" who was lured to Alaska in 1900 by the stories she had heard of gold strikes in the Territory, and who succeeded in making a modest fortune for herself, this book will provide the reader with several hours of interesting reading. Pictures of life at Nome, episodes of the trail, and character sketches combine to make an entertaining yarn. As for authenticity we must rely upon the author. An epilogue by Mr. Odlum relates that Miss Fitz netted over $100,000 in gold from the Ophir Creek claims, continuing to operate until 1906, when she married one John Sanger, with whom she subsequently settled down in the effete East.

▼ ▼ ▼

PUBLICATIONS

RECEIVED

The Mineral Industry During 1940. Vol. 49, edited by G. A. Roush. Published by McGraw-Hill Book Co., New York. Pp. 778. Price $12. This volume has been received just as we are going to press. Further notice of it will be taken next month.

Battelle Memorial Institute. List of books and publications issued and of patents taken out by staff members of the Institute, at Columbus, Ohio, from 1929 to 1940 inclusive. Compiled by Thelma R. Reinberg, librarian. Pp. 47.

Mine Timber Studies. Two papers—"Stresses in Mine-Drift Timber-Sets," by R. L. Grazier, and "Increasing the Endurance of Drift Sets," by R. B. Gayer. Colorado School of Mines *Quarterly*, July, 1941. Price 50c.

Directory of Montana Mining Properties. Compiled by Work Projects Administration, Mineral Resources Survey, in cooperation with the Mining Association of Montana. Issued as Memoir No. 20 by Montana Bureau of Mines and Geology. Pp. 135.

Gold Mining Industry in Canada, 1940, A Summary Review. Issued by Dominion Bureau of Statistics. Pp. 71, plus an appendix. Price 50c.

Transgressive and Regressive Cretaceous Deposits in Southern San Juan Basin, New Mexico. By J. D. Sears, C. B. Hunt, and T. A. Hendricks. Professional Paper 193-F, U. S. Geological Survey. Sold by Superintendent of Documents, Washington, D. C. Pp. 101-119, plus map.

The Dependence of Arizona on the Mining Industry. "Some statistics on the production, taxes, and far-reaching influence of the mines—and their contributions to the economic stability of the State and welfare of its inhabitants." Compiled by Arizona Department of Mineral Resources, Phoenix. Pp. 46.

"Brasil 1939–40." An Economic, Social, and Geographic Survey. Issued by Ministry of Foreign Affairs, Rio de Janeiro. Pp. 387. This annual review, in English, includes a 48-page section on minerals and mineral production.

South Africa. "Geology of Country Around Pochefstroon and Klerksdorp," an explanation of Sheet No. 61. Geology Survey, Pretoria, Union of South Africa. Pp. 156. Price 5s., including map.

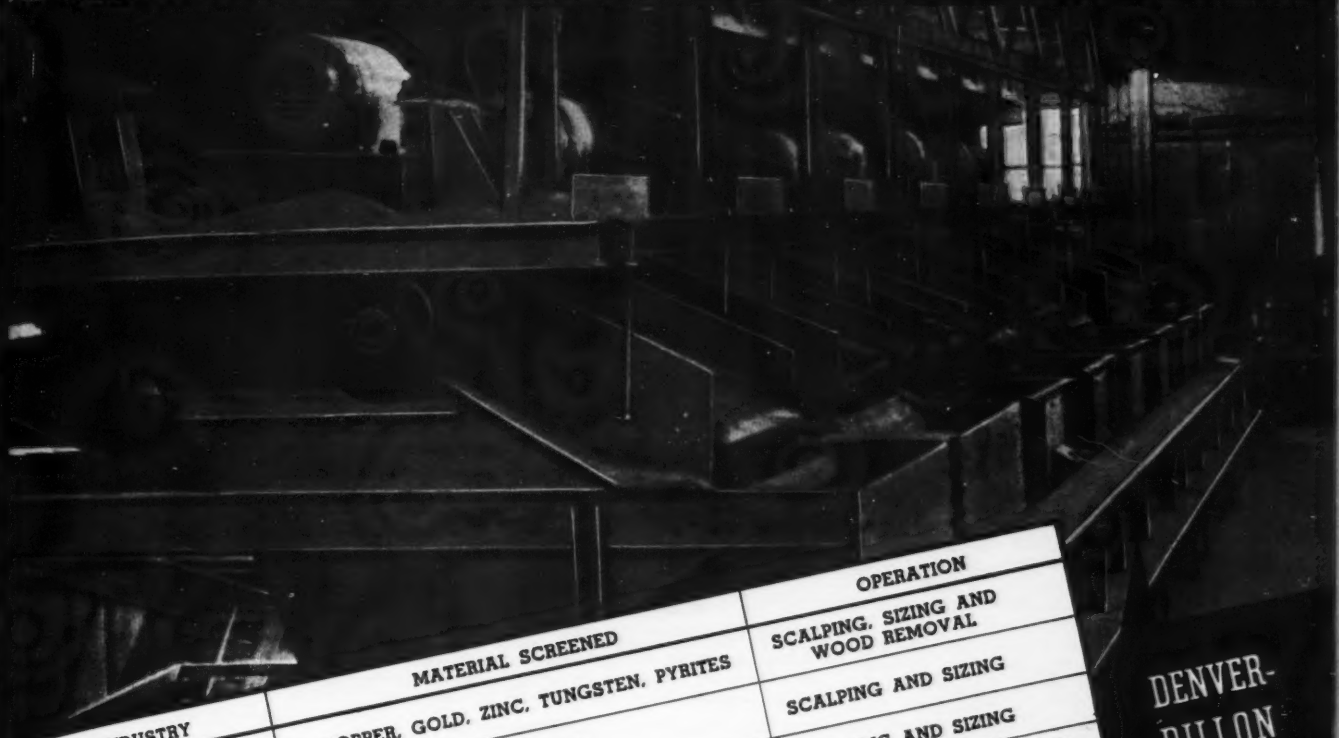
South Africa. "Industrial Mineral," November, 1940. A quarterly report showing production, sales, exports, and names of producers for Union of South Africa and Territory of Southwest Africa. Issued by Department of Mines, Pretoria, South Africa. Pp. 43.

"Mica in Tanganyika Territory." Bulletin No. 14, Geological Division, Department of Lands and Mines, Dar es Salaam, Tanganyika Territory, Africa. Pp. 51, price 3s.

Transvaal Chamber of Mines. Fifty-first Annual Report for 1940. Issued by the Chamber of Johannesburg, South Africa. Pp. 161. This report contains the usual information; statistical and otherwise, respecting operations and labor situation.

DENVER-DILLON Floating Circle VIBRATING SCREEN

3 OF 14 DENVER-DILLON SCREENS ACQUIRED IN PAST FOUR YEARS BY A LARGE COPPER-GOLD PRODUCER



INDUSTRY	MATERIAL SCREENED	OPERATION
MINING—METALLIC	COPPER, GOLD, ZINC, TUNGSTEN, PYRITES	SCALPING, SIZING AND WOOD REMOVAL
MINING—NON-METALLIC	TALC, ASBESTOS, GYPSUM	SCALPING AND SIZING
METALLURGY	ALUMINUM DROSS, CHROMIUM, GOLD FILTER CAKE, NICKEL SHOT	SCALPING AND SIZING
COAL & COKE	ANTHRACITE AND BITUMINOUS COAL, DOMESTIC COKE	SIZING, RE-SCREENING AND DE-DUSTING
SAND & GRAVEL	BANK-RUN GRAVEL, CRUSHED GRAVEL, SAND	SIZING; WET AND DRY
ROCK PRODUCTS	CHERT, LIMESTONE, TRAP ROCK, MARBLE CHIPS, ROOFING GRANULES, HAYDITE	SIZING; WET AND DRY
CEMENT	RAW AND FINISHED CEMENT	SCALPING AND SIZING; WET AND DRY
ABRASIVES	ALUMINOUS OXIDE, SILICON CARBIDE	SIZING
CHEMICAL	IRON BORINGS, VANILLIN, ZINC OXIDE	SCALPING AND SIZING
FOOD PRODUCTS	CEREALS, WHEAT CHAFF, PULVERIZED ALFALFA	SCALPING, SIZING AND DE-WATERING
FOUNDRY	NEW AND USED MOLDING SAND	SCALPING AND RE-CONDITIONING
REFRACTORIES	MAGNESITE	SIZING
PULP & PAPER	WOOD CHIPS, SAWDUST	SIZING
LABORATORIES	VARIOUS PRODUCTS	WET AND DRY SCREENING

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News OF THE INDUSTRY

What Metal Statistics Show

COPPER PRODUCTION declined 2.8 percent in July against that of June, with output totaling 80,043 tons, according to the Bureau of Mines. Preliminary reports indicate mine output in August will be around 79,300 tons.

Output of lead from domestic mines also decreased, a drop of 3 percent below the June figure, or 36,867 tons being produced from domestic ores.

Shutdowns for repairs at some Western mines and mills temporarily curtailed zinc output, the figure being 59,800 tons of recoverable zinc for July.

The August statistics of the Copper Institute revealed that production of both crude and refined copper held to about the same rate as in July. Production of blister during August totaled 84,977 tons, of which 78,046 was mine output, 4,934 tons intake by custom smelters, and 1,997 tons scrap.

Included in the domestic deliveries for August were 29,606 tons of copper of foreign origin released by the Metals Reserve Co. This compares with 32,463 tons released in the prior month.

The Institute's figures for July and August, in tons, compare as follows:

Production:	July	Aug.
Crude	(a) 82,099	84,977
Refined	86,879	85,426
Deliveries, refined:		
Domestic customers	(b) 143,089	117,262
Export	33	.....
Totals	143,122	117,262
Stocks at end, refined	74,384	72,154

(a) Revised. (b) Includes duty-paid foreign copper.

▶ ZINC—The domestic zinc statistics (all grades) for August and September, according to the American Zinc Institute, follow:

Production of Prime Western and other grades for September, follow:

	Aug.	Sept.
Stock at beginning	13,848	17,969
Production	75,524	73,225
Total	89,372	91,124
Production daily rate	2,436	2,441
Shipments:		
Domestic	61,061	64,673
Foreign (drawback duty)	10,342	7,094
Total shipments	71,403	71,767
Unfilled orders	68,604	67,079
Stock at end	17,969	19,427
Prime Western		30,796
Select		1,456
Brass Special		5,570
Intermediate		4,548
High Grade		15,088
Special High Grade		15,767
Total		73,225

QUICKSILVER—Quicksilver statistics for the first seven months of the current year, in flasks of 76 lb. each, follow:

	Production	Consumption	Stocks (a)
January	3,100	2,900	14,100
February	2,900	4,700	12,100
March	3,500	4,000	11,600
April	3,500	3,200	11,700
May	3,600	3,500	10,700
June	4,000	3,300	11,400
July	3,400	3,200	11,300

(a) Consumers' and dealers' stocks.

E & M J Weighted Index of Non-Ferrous Metal Prices

(100 is composite for 1922–3–4)

1929	110.33	1935	74.66
1930	82.87	1936	73.45
1931	60.20	1937	90.86
1932	48.26	1938	73.67
1933	59.79	1939	77.71
1934	69.59	1940	79.22

	1939	1940	1941
January	77.12	80.85	82.48
February	76.89	77.23	82.76
March	77.00	77.94	83.27
April	74.79	77.19	83.48
May	73.61	77.68	83.48
June	73.17	78.85	83.51
July	71.95	76.72	83.60
August	73.88	76.71	83.39
September	83.07	79.40	83.34
October	84.25	82.49	....
November	83.80	83.14	....
December	82.89	82.42	....

LEAD—Statistics covering lead refined in this country for the months of July and August, in tons, according to the American Bureau of Metal Statistics, follow:

	July	Aug.
Stock at beginning	24,265	19,172
Production:		
From domestic ore	42,048	39,100
Secondary and foreign	6,941	12,057
Totals	48,989	51,157
Domestic shipments	54,067	55,005
Stock at end	19,172	15,330

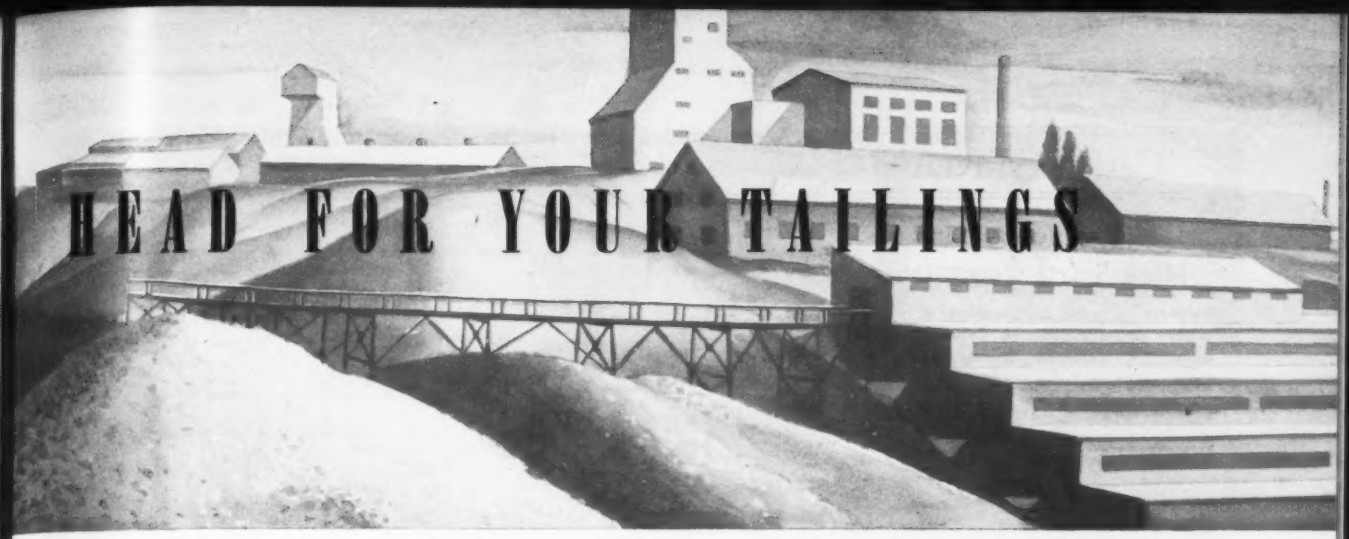
Lead was placed under full priority Oct. 4.

Purchases of Critical Materials by RFC

The Metals Reserve Co., with the approval of the Reconstruction Finance Corp., has made the following commitments in critical and strategic materials since June 28, 1940, and up to the close of business on Sept. 13 this year, according to Jesse H. Jones' recent report to Congress:

	Tons Delivered	Tons Afloat	Tons On Order	Amount
Aluminum:				
Import	.....	.....	340,100	$180,034,000
Antimony:				
Import	7,014	.....	19,623	6,403,000
Domestic	1,250	.....	1,750	780,000
Asbestos:				
Import	197	273	1,090	215,000
Bauxite:				
Import	.....	2,500	11,150	101,000
Cadmium:				
Import	67	.....	.....	139,000
Chrome:				
Import	59,579	50,000	298,803	12,015,000
Domestic	.....	.....	108,000	4,285,000
Copper:				
Import	269,246	.....	(a) 231,254	140,110,000
Diamonds:				
Import	.....	.....	.....	708,000
Graphite:				
Import	411	3,617	883	486,000
Iridium (765 oz.)	.....	.....	.....	120,000
Lead:				
Import	88,871	5,203	151,053	31,819,000
Manganese ore:				
Import	271,456	30,967	1,034,038	41,766,000
Domestic	7,943	.....	1,792,057	66,804,000
Mercury:				
Import	.....	10	40	9,000
Mica:				
Import	.....	.....	2,757	3,069,000
Nickel:				
Import	.....	.....	11,600	4,749,000
Quartz crystals:				
Import	.....	.....	450	3,150,000
Tin (refined):				
Import	39,592	3,150	(b) 143,258	207,500,000
Tin ore:				
Import	13,645	1,773	263,127	122,434,000
Tungsten:				
Import	2,831	275	65,098	113,169,000
Domestic	.....	.....	2,850	4,165,000
Zinc (refined):				
Domestic	.....	.....	86,000	13,470,000
Zinc ore:				
Import	2,112	9,580	187,106	3,843,000
Brazilian Materials	.....	.....	.....	(c) 3,625,000
Mexican Materials	.....	.....	.....	(c) 2,576,000
Peruvian Materials	.....	.....	.....	(c) 2,000,000
Total amount, value				$969,544,000

(a) Includes 195,800 tons for which purchase contract is not yet executed.
(b) Includes 88,026 tons for which purchase contract is not yet executed.
(c) Balance of estimated amounts for expenditure in 1941.



HEAD FOR YOUR TAILINGS

• All your wastes are not on the dump in plain sight. Your most costly and sometimes most easily recoverable wastes slosh down the hill, go up your stacks or float away in air.

• Most dust clouds have a silver lining and your stack and crushing plant is no exception. Metallurgical slimes that can't be filtered wash down stream carrying values.

• There are remedies for turning all these losses into cash profits that will completely pay for the necessary equipment in a short time, after which everything is net gain.

COTTRELL ELECTRICAL PRECIPITATORS collect gold, silver, copper, lead, bismuth, arsenic, selenium, tellurium and other elements from escaping fume and give you cash values—dollars in the bank day after day, year after year.

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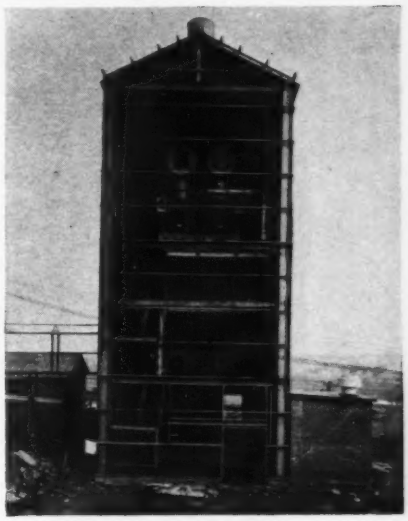
• These three types of tested equipment are saving millions of dollars a year in the mining industry. (One plant alone saves a million dollars a year in gold and silver.) Little or big, there's a size for any capacity, a design to give the required efficiency. Low operating cost. Quick complete liquidation of investment. Easy installation and operation.



Cottrell Electrical Precipitator collecting acid mist and metallic values in the mining industry.

Write today for your copy. These four bulletins cover the range of dust collection and the recovery of solids from solutions, suspensions, slurries and filter cake. Check the one in which you are interested. ☐ *Cottrell Electrical Precipitation.* ☐ *Multiclone Dust Collectors.* ☐ *Turbulaire Spray Dryers.* ☐ *Turbulaire Dispersion Dryers.*

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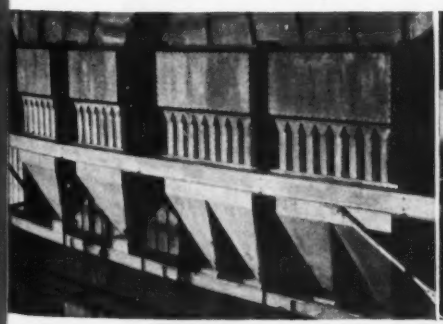
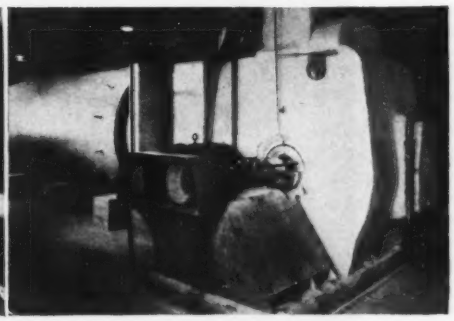


Multiclone assembly cleaning vented air and recovering values in crusher plant. Capacity 92,000 c.f.m.



Turbulaire Dispersion Dryer recovering solids from metallurgical slimes. Recovery is instantaneous and continuous.

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CALIFORNIA

Mill at Jenny Lind Mine Starts Operations

Property is under the direction of a subsidiary of Pacific Mining Co.—Some gold mines in Mariposa County being rehabilitated

▶ Milling operations have been started at the Jenny Lind gold mine, near Hornitos, Mariposa County, following completion of a 150-ton flotation mill and surface plant. Daily production averages 100 tons, with comprehensive development work in progress on several levels underground. The property is operated by the Lind Mining Co., a subsidiary of Pacific Mining Co., of San Francisco. About 40 men are employed under the direction of P. R. Bradley, Jr., who is also in charge of the company's Pine Tree and Josephine mines, in Mariposa County, and the Harvard property, at Jamestown, Tuolumne County.

▶ Rehabilitation and test work is in progress at a group of gold properties near Mariposa, Mariposa County, including the Mt. Ophir, Princeton, Green's Gulch, Lewis, Mountain View, and Ortega mines, which were optioned recently by J. K. Wadley, of Texarkana, Ark., and associates. The holdings are owned by the Mariposa Commercial & Mining Co., Judge Edgar T. Zook, president, and Charles, Greenamayer is in charge of operations for the Wadley interests.

▶ Operations have been suspended and equipment is being removed at the Palisades silver mine, near Calistoga, Napa County, owned by J. H. Hare and Phil Cox. At times from 35 to 50 men were employed at the property, with mined ore benig treated at a 200-ton flotation-cyanide mill.

▶ Retimbering of underground workings as a preliminary to development has been started at the Zaca mine, at Markleeville, Alpine County, by E. T. Drake and associates of Reno, Nev., who leased part of the property from H. B. Chessher who had a lease and option on the holdings from Zaca Mining Co.

▶ Work to facilitate operation of four hydraulic monitors during the coming season is proceeding satisfactorily at the property of Gibsonville Mining Co., near La Porte, Plumas County. About 15 men are employed under the direction of M. B. Turner, superintendent, in preparing an additional water supply, including construction of new ditches.

▶ Dredging operations have been started on placer ground along Butte Creek near Chico, Butte County, where Lancha Plana Gold Dredging Co. reassembled the bucket line dredge formerly active near Ione. The leased dredging area covers some 600 acres. Charles G. Patmon is president and general manager.

▶ Work is to be resumed soon at the Red Elephant quicksilver mine in the Knoxville area of Lake County, by the Red Elephant Mines Co., headed by Nevada interests. The property is equipped with a small reduction plant, and has been under development for many years under different operators.

▶ A milling plant has been placed in operation at the Feliciana gold mine, near Mariposa, Mariposa County, worked under lease by Russell J. Wilson. Machinery installed is that used formerly at the Black Oak mine, in Garden Valley, El Dorado County, operated by Wilson for several years. William Bessler is superintendent.

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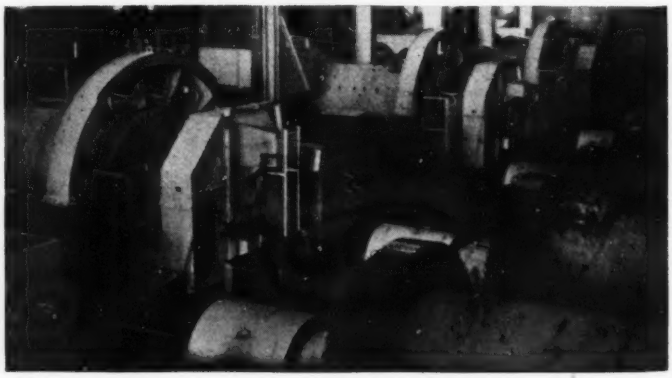
* Asbestos, Mercury, Ind., Diamonds, Quartz, Platinum, Radium, Uranium, Kyanite, Abrasives, Diamond Dies, Jewel Bearings.

All chiefs of above groups report to W. L. Batt, Director of Materials Division of OPM.



A battery of ball mills at the concentrator of Nevada Consolidated Copper Corporation, Hurley, New Mexico

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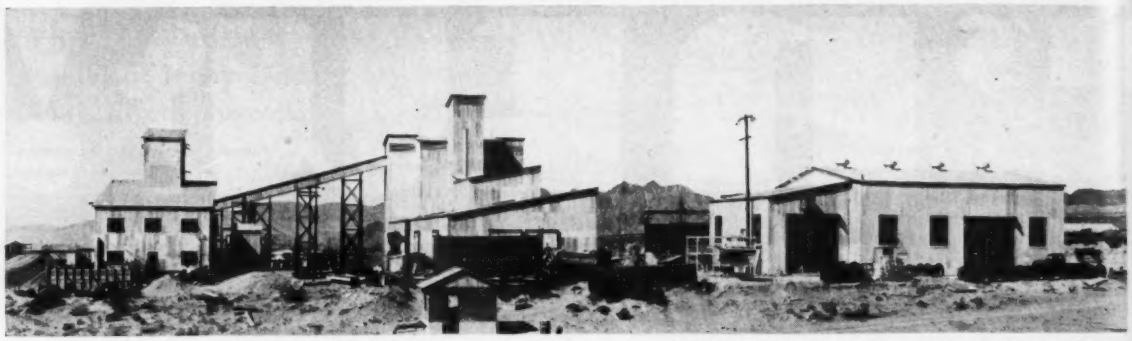


Metallurgical Division, U. S. Bureau of Mines, Salt Lake City, Utah

Near Boulder City, Nev., is the above 40-ton pilot plant operated by the Metallurgical Division of the U. S. Bureau of Mines for the recovery of manganese from a deposit of manganese, near Las Vegas, Nev., estimated to contain nearly a million tons of ore containing more than 10 percent manganese. Ore is trucked to the crusher plant on the left and then conveyed to the mill in the center, where first operations produced a product that analyzed, after sintering, 52 percent manganese, 1 percent iron, and 9 percent silica

NEVADA

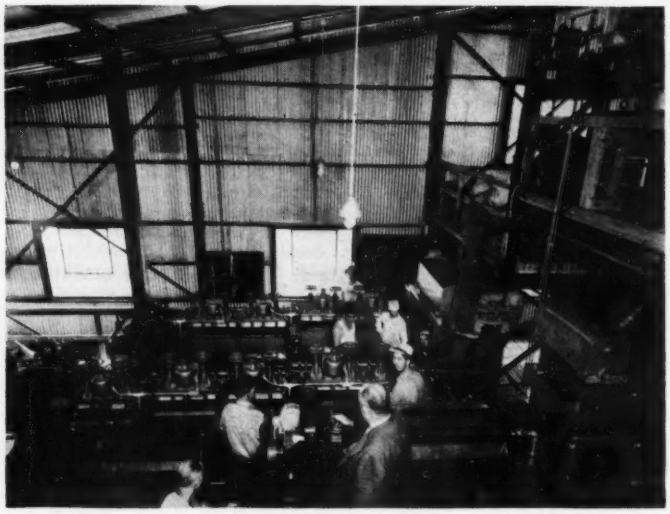
Manganese Production Started From Pilot Plant

Metallurgical Division of the U. S. Bureau of Mines is making manganese suitable for manufacture of ferromanganese

▶ Production of high manganese content concentrate from the low grade deposits in the Las Vegas, Nev., area was reported by the Federal Bureau of Mines to Secretary Ickes on Sept. 13. Dr. R. R. Sayers, Director of the Bureau, reported that the first unit of the comprehensive group of pilot plants built by the Bureau of Mines at Boulder City, Nev., under a defense appropriation, has started operations. A test run just concluded has demonstrated definitely the applicability of a process developed in the Bureau laboratories for supplying a portion of the defense requirements of manganese from domestic sources.

The capacity of the Boulder City pilot mill is 40 tons per day. The first ore treated came from a deposit in the Wash mining district, near Las Vegas, where Bureau engineers have estimated there are nearly a million tons of ore containing more than 10 percent manganese and that there is more in the adjacent Virgin River district. Except for a small amount of high-grade material mined during the World War, this reserve of manganese has been undeveloped, because until the Metallurgical Division of the Bureau of Mines started on its present program the ore had resisted all attempts at concentrating it to an extent which would permit its use for the manufacture of ferromanganese. Success in the treatment of the ore was first attained when a new reagent, DLT-958, was tried. This reagent, developed by a chemical company as a result of the laboratory investigations of the Bureau of Mines, was found to float the worthless gangue away from the manganese and leave the manganese in a form which, when sintered, met every requirement for material for the manufacture of ferromanganese.

The product in the first operations analyzed, after sintering, 52 percent manganese, 1 percent iron, and 9 percent silica. The recovery from the ore was slightly above 70 percent. It is thought recovery may be increased as the operation of the plant is further perfected. Experiments have shown that the lead and copper present in concentrates of the Las Vegas ore can be eliminated by a roasting treatment. Complete data on costs will be determined as operations continue.



Metallurgical Division, U. S. Bureau of Mines, Salt Lake City, Utah

Modern equipment is employed in the flotation unit of the Bureau of Mines pilot plant to recover manganese. Success in the treatment of the low-grade ore treated was first attained when a new reagent, DLT-958, was tried. This reagent floats the worthless gangue away from the manganese and leaves the manganese in a form, which when sintered, meets requirements for material for the manufacture of ferromanganese

▶ Cinnabar property in the Relief district of Pershing County, operated formerly by the Pershing Quicksilver Co. and with production in 1929 of 6,000 flasks, is being reopened under direction of L. R. Messer, said to represent directors of the First National Bank of Chicago. The property, equipped with 50-ton Gould rotary and 8-hearth Nichols-Herreshoff furnaces, had been controlled for some years by the late George Herbert Jones, head of the Chicago bank. A. Livingston of Lovelock, Nev., is resident agent for the owners.

▶ A new deep shaft is to be started in November on the Ruby Hill silver-lead-gold mines of the Richmond-Eureka Mining Co., two miles west of Eureka. The properties are under lease to the Eureka Corporation, Ltd., reputedly a subsidiary of Ventures, Ltd. of Toronto. Thayer Lindsley, president of both companies, recently stated that ore was found in deep drilling and has notified District Judge Edgar Eather, of Eureka, resident agent, of plans to start the new shaft. William Sharp is manager at Eureka.

▶ Because of the continued flow of water in the vertical shaft that has been sunk 1,000 ft., the Gray Rock Mining Co.,

GGING AND LOADING ASPHALT—TRINIDAD

THE story of the development of satisfactory flotation reagents for beneficiation of sulphide ores is an interesting one. Years ago the idea was advanced that some reagent should be capable of separating metal particles from crushed ores. Almost an unlimited list of substances, including even asphalt, were tested for this purpose without success.

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NOTE: The new edition of the BEAR BRAND Flotation Index, which lists books, pamphlets and articles on flotation, is ready. Write for your free copy.

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*From Sharples Amyl Alcohol

Nevada Massachusetts Co., Mill City, Nev., recently erected the above new 1,000-ton plant for treatment of tungsten tailings

▶ NEVADA

subsidiary of Newmont Mining Corp., is said to have discontinued all work on the Elkoro mine, at Jarbidge, northern Elko County, and equipment is being moved to Newmont properties at Grass Valley, Calif.

▶ Construction of barracks and other accessory buildings has started at the site of the RFC-financed electrolytic magnesium plant about midway between Boulder dam and Las Vegas, for which, with calcining plant at the magnesite source in northern Nye County and a salt-mining set-up near Mead Lake, the federal loan agency has allocated $63,000,000. The construction contract for the main plant was awarded to the McNeil Construction Co., of Los Angeles. The plant will be owned by the Defense Plants Corp., and operated by Basic Magnesium, Inc., of Cleveland, Ohio. Howard P. Eells, Jr., president. To transport some 1,200 tons of magnesite per day from mine to plant, around 400 miles, an abandoned 70-mile gap of the Tonopah & Tidewater railroad between Goldfield and Beatty probably will be rebuilt and the road south of Goldfield be operated by the Union Pacific, with which it connects at Crucero, Calif. Magnesite from the same deposits in the Mammoth district is being shipped to the Permanente Corp. plant at Los Altos, Calif., at around 300 tons per day. R. O. Jones is in charge of magnesite production for the Barium Products Co., Ltd., at Luning, 32 miles from the deposits and the rail shipping point.

▶ The 150-ton cyanide mill of the Black Mammoth Consolidated Mining Co. at Silver Peak, Esmeralda County, was destroyed by fire late in September. It was built in 1936 to treat gold ore from the Mary mine and for the past year had operated as a custom mill, the company's mine having been leased to E. L. Cord. Fred A. Vollmar Jr. is president and manager of Black Mammoth and Arthur N. Sweet is Cord's manager.

▶ An option on the Tonopah properties of the Tonopah Belmont Development Co. was said to have been granted to Richard C. King, of Hollywood, for the Nevada Engineering Co., of Goldfield, of which King is president. Announced plans include construction of a 200-ton mill to treat Belmont and custom ores; also a cyanide leaching plant to handle tailing from the long-dismantled 500-ton cyanide mill. Fred Steen is agent for the Belmont company at Tonapah.

▶ A selective-flotation mill designed to treat 550 tons per day of the complex lead-zinc sulphide ore of the Pioche district began crushing ore early in September at the Caselton mine of the Combined Metals Reduction Co., seven miles from Pioche, in Lincoln County. The mine force is being increased to around 450 men. E. H. Snyder, Stockton, Utah, is vice-president and manager.

▶ Installation of a 125-ton Nichols-Herreshoff furnace of the unit type has been completed by the Cordero Mining Co. at its cinnabar property 13 miles south of McDermitt, in northern Humboldt County. The furnace was fabricated by the Pacific Foundry Co., of San Francisco. The company is an affiliate of Horse Heaven Mines, Inc., of Oregon, both wholly-owned subsidiaries of the Sun Oil Co., and both headed by J. Edgar Pew, president of Sun Oil Co., of Pennsylvania. D. Ford McCormick is manager at McDermitt, Nev.

UTAH

Zinc Recovered From Smelter Slag

International Smelting & Refining Co. starts operation of plant at Tooele—Utah Magnesium Corporation to build plant at Crescent Junction

▶ The International Smelting and Refining Co. has put into operation its new $340,000 lead-slag treatment plant to recover zinc. Recovery of the greater part of the zinc now being lost in the smelting of lead ores will add from 1,000,000 to 2,000,000 lb. of zinc monthly, A. B. Young, assistant general manager of the International company, estimates. Metallurgy of the process was worked out at Tooele 15 years ago under patents granted to U. A. Garred and acquired by International and its associate companies. Air and pulverized coal is blown through molten slag in a furnace of the blast type. The fume is conducted to a baghouse. Fume containing lead is passed through a rotary kiln and caught in a separate baghouse. The deleaded zinc recovered is shipped to an Eastern refiner and the lead is returned to the lead blast furnace.

▶ John Sanburg, president, Utah Magnesium Corp., announced late in September that his company had secured Government funds to commence immediate construction of a $1,500,000 chemical plant at Crescent Junction, 30 miles north of Moab, to convert brine from a Salt Lake Valley deposit into magnesium chloride. The company hopes to be shipping 8 to 10 carloads of chemical daily within three months. Fay L. Wright, of Los Angeles, is consulting geologist and general manager.

▶ Production of ore through the newly completed Elton tunnel of the National Tunnel & Mines Co. at Tooele is to start about Nov. 1. Two ore pockets have been completed. A hoist room and other facilities are being made ready near the intersection of the tunnel and the Rood Shaft of the Utah Apex mine.

▶ The American Metal Mining Co. is reopening the old Brandburg tunnel, in the South Fork of Big Cottonwood canyon. Frank Yancher is in charge of operations.

▶ The Combined Metals Reduction Company is treating in its Bauer plant 25,000 tons of complex zinc-lead ore monthly. Four thousand tons of this ore is coming from the company's Calument mine, Tooele County, with the tunnel portal at Bauer.

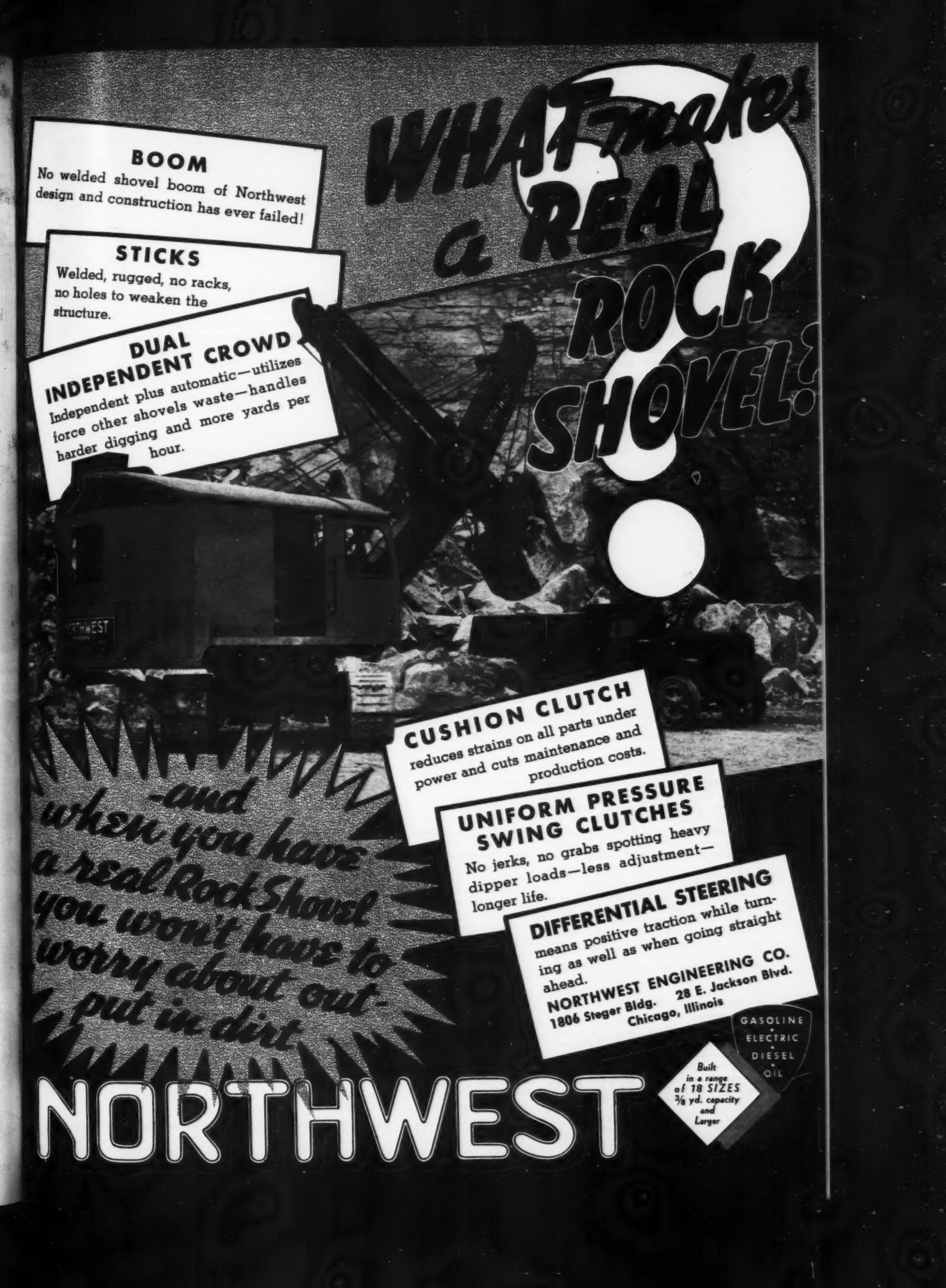
▶ A contract to deliver 40 tons of dead-burned magnesite to the Bremerton, Washington, navy yards is being filled by the Silver Shield Mining & Milling Co., Harry S. Joseph, manager, reports. The ore will be mined from the company's Fish Springs property, in Juab, and will probably be treated at Grantsville.

▶ Tungsten ore is being developed by the Little May Mining Co. at its Milford Lilly property, in Beaver County, reports Nicholas Crawford, consulting engineer. Sinking of pits and trenches is reported to have outlined a considerable area containing scheelite assaying 1.5 percent tungstic acid.

▶ New Park Mining Co. reports a net profit, after depreciation and Federal income taxes, of $105,507 during the first six months of 1941, compared with $92,863 during the first six months of 1940. Ore sales totaled $384,020, a $148,000 increase over the first six months of 1940. Mine-operation expense doubled to $264,020 by reason of increased development and installation of much new equipment.

▶ Completion of the Union Pacific Railroad spur line extending 9,300 ft. from Keetley to the portal of the New Park Mining Co.'s Mayflower tunnel was celebrated, Sept. 21. The new station was named Cranmer, in honor of W. H. H. Cranmer, president and general manager of the New Park Mining Co., who has taken the lead in developing this newly productive area in the East Park City district.

▶ For the second time in the last 18 months, the Utah Supreme Court ruled that the holder of a mine lease has the status of an employee and therefore is subject to the unemployment compensation act.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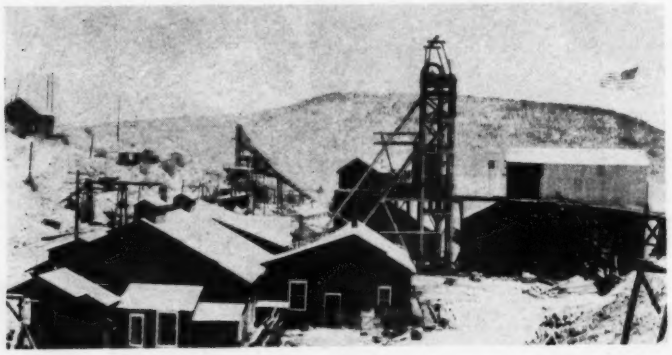

Old Glory flies proudly at the Ajax mine, Cripple Creek, Colo., where 500 ft. of shaft sinking is under way to connect with the Carlton tunnel. This mine was dewatered in ten days when the Carlton tunnel struck a heavy flow of water in the Newmarket fault

COLORADO

Portland Mine Tapped By Drill Hole

Several additional bores speed dewatering of mine through Carlton Tunnel—Zinc being recovered from old slag dump near Durango

▶ A 2-in. hole drilled upwards from the Carlton tunnel towards the Portland mine entered the lowest part of the mine, and water at the rate of 1,200 g. p. m. rushed from the hole. Other holes have been drilled to increase the flow so as to dewater the Portland mine. Surveys located this distance from the crosscut, and it proved to be exactly 18.5 ft. After complete drainage of the Portland this section will be opened for the purpose of ventilation, to be followed by development.

▶ Ed. Rossiter and Henry Pryor have leased the dumps of the dismantled A. S. & R. company smelter at Durango. During the half century the smelter was operated the zinc contents of ores treated was not saved; with the slag it went onto the dumps. Assays show that there is a considerable tonnage of the dump that averages from 10 to 27 percent zinc. The lessees are shipping the recovered ore to zinc smelters.

▶ The Stratton Cripple Creek Mining & Development Co. shipped 18,845 dry tons of ore to the Golden Cycle mill during the first half of 1941. The average value of ore shipped is approximately $15 per ton. Longfellow mine, one of the properties, is shipping $20 ore from a streak 15 ft. wide. The Proper mine is the largest shipper of the group, but the Longfellow, Logan, and Favorite are shipping the higher-grade ore. J. O. B. Keener is general superintendent in charge of operations.

▶ Negotiations have been completed whereby Erland F. Fish, of New York, has purchased the dredge boat, the ground ahead of the boat, and a portion of the Tonopah shops from the U. S. bankrupt court, of the Royal Tiger mines and the Tiger Placers companies, at Breckenridge. This opens the way for the sale of the remainder of the property.

▶ The people of Colorado and especially those of Lake County have been anxious to learn the facts concerning the Climax Molybdenum Co. tax settlement with Lake County. The settlement was made with full knowledge and approval of every tax-levying and -collecting department in the State through whose hands the matter had to pass. The 1939 tax assessment was $16,276,745 and this amount was reduced to $12,339,282 by agreement. The items were considered separately and the assessment of output and concentrates were changed because of the question on value. The county's assessment on the corrected assessed valuation was 16.3 mills and amounted to $201,130.30; added to this was the State mining tax of one mill, or $11,369.70, or a total of $212,500. The production assessment was settled on a basis of 4,344,734 tons, at $2.37, instead of $2.90, a ton. The 1940 tax settlement was based on abatement procedure. This was necessary due to the fact that Lake County claimed full assessment on the Climax water system, whereas 77 percent of it is in Summit, 4 percent in Eagle, and 19 percent in Lake County. There was also the matter of about $2,000,000 worth of concentrates that were stored in Summit County April 1, 1940, when assessed, although the concentrates had been in Lake County for some time previous. The valuation was thus brought to $11,160,674 and on settlement made on this basis, giving Lake County $104,352, and the State mining fund tax was $12,333.

▶ A new custom mill in Clear Creek County is now under construction by R. G. Millikin and a group of Easterners, on the old Town property, in Russell Gulch. The foundation calls for a 75-to 100-ton mill, which is expected to be ready for operation early in October under the direction of Alfred Tellam.

▶ A millsite, convenient for the handling of ores from the several mines of the Gold Empire, Inc., has been excavated, and construction is under way. The Gold Empire Co. reports that it has contracted to deliver 500,000 tons or more from its group of mines into the bins of the mill for treatment at a flat price of $2.25 a ton. The new mill will be known as the Rosebud mill, and will be similar in design to the Cameron mill, which has been very successful. Edward L. Sweeney, of Denver, has a crew of men on construction, which is being sponsored by E. E. Rockfield, of the Rockfield Equipment Co., who states that the mill will be increased to 200 tons' capacity as soon as necessary.

▶ Earl F. Crowl, president and general manager of San Juan Gold King Mines, Inc., was in Silverton recently to inspect the Gold King mine properties at Galdstone. He plans development work in the Gold King and Gold King Extension vein systems from the American tunnel.

▶ The Treasure Mountain Gold Mining Co. has started erection of the new mill in Picayune Gulch, Silverton, and several truck loads of mining and milling machinery have been received and the various units are being installed, so that the mill will soon be in operation.

ARIZONA

Alunite Deposits Being Investigated

Areas near Quartzite attract attention—Negotiations under way by government and Phelps Dodge Corp. leading to doubling copper output at Morenci

▶ Two large deposits of alunite are being examined by Kalunite, Inc. These properties are in the Sugarloaf Butte district. Final plans of the plants Kalunite, Inc., will erect are not yet approved, but Frank Eichelberger, of Spokane, Wash., president of the Kalunite company, has developed new processes for the treatment of the alunite and the plans are now before the U. S. Bureau of Mines. The company plans the production of 60,000,000 lb. of aluminum yearly.

▶ Seeking to obtain additional supplies of copper for the national defense program, government officials and the Phelps Dodge Corp. are conducting negotiations leading to a duplication of copper output now established at the new Phelps Dodge Morenci unit. Production is expected to start at Morenci before the end of this year, with annual capacity output of copper estimated at 60,000 tons. Jesse H. Jones, Federal Loan Administrator, announced on Oct. 1 that $28,000,000 had been set for the construction of necessary plants and facilities for an additional 60,000 tons of copper to be produced at the Morenci unit. The proposed plant would be leased to Phelps Dodge by the Defense Plant Corp.'s a subsidiary of RFC. One of the problems involved in the proposed undertaking would be to provide an additional water supply for ore treatment.

▶ The Ord mercury mine, on Slate Creek, in the Tonto Basin country, has been taken over by the Cord interests and development work is going on under the direction of A. N. Sweet, president and general manager of those interests. The mine has been working since early in 1940 and has produced 780 flasks of

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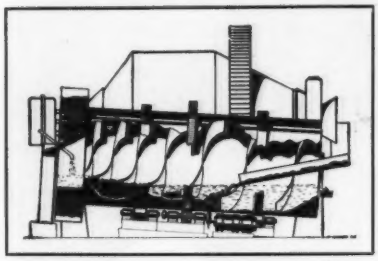

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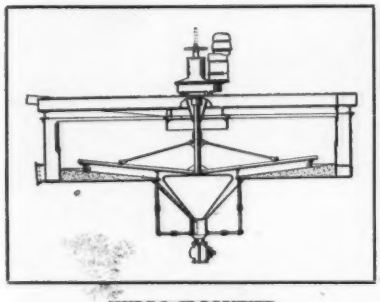

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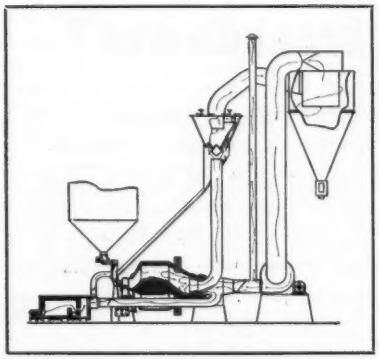

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▶ARIZONA

quicksilver. The 25-ton furnace has been in constant operation. L. E. Foster, who has been manager and consulting engineer for the Ranney interests in previous operations, will continue under the new régime.

▶ Nine manganese claims known as the Dough Boy properties, near Globe, will go into production as soon as a road now under construction is completed. Anton Trojanovich, of Globe, is owner of the property.

▶ The Allison mine, in the Baboquivari district, operated by the Gold Bar Mining Co., has worked out a new flowsheet for its 50-ton milling plant, using cyanidation and flotation. The values in gold and silver are said to run $14.50 to $15 per ton. This average value has been maintained in shipments made since last December. L. M. Vreeland, National Bank Building, Tucson, Ariz., is manager and R. M. Gammell is general superintendent. A crew of 15 men is employed.

▶ The tunnels at the properties of the Universal Mining & Smelting Co. in the Dripping Springs district, 30 miles southwest of Globe, are being rehabilitated by a crew of seven men. Frank M. Pool, Superior, Ariz., is president of the company.

▶ The Pachan scheelite properties, near the head of San Domingo wash, near Morristown, are being developed by a crew of five men under the direction of G. C. Rhodehamel, of Morristown. A small tonnage of hand-sorted ore is going to market regularly.

▶ Reynolds Metals Co., R. S. Reynolds, president, of Richmond, Va., is making an examination of the Ropp alunite claims near Quartzsite. The alunite property is situated near Sugar Loaf Mountain.

▶ Work on the property of Ari-Butte Operating Co., at Sombrero, has gone to a three-shift basis. The company is reported to have 24,000 tons of ore ready for milling. A 50-ton flotation mill has been reconditioned and put into production treating ore containing copper, lead, silver, and gold. O. W. Blevins, of Sombrero Butte, is president of the company.

▶ The Vivian mill, at Oatman, has been stepped up to 60 tons per day. Recent discoveries of good gold ore have encouraged plans to increase mill capacity to 105 tons daily. Custom ores are also to be accepted at the mill for treatment. A. E. Taitem is general manager and W. F. Ames superintendent. Both are of Oatman. A. F. Kern, 110 Sutter St., San Francisco, Calif., is president of the Vivian Mining Co., Inc.

▶ The Ayers-zona Gold Mining Co. is operating the Ayers lode properties in the Laguna district on the Arizona side of the Colorado River near Yuma. The company was recently reincorporated with a capitalization of $100,000. James Syers, Andrew Kopulas, and W. E. McCaw, all of Yuma, are the incorporators.

▶ The 75-ton flotation plant recently started on the COD mines, 12 miles north of Kingman, in the Cerbat Mountains, is treating dump ores and is reported making good recoveries. An old shaft is being opened and retimbered, and the upper workings of the mine will soon be opened to reach old reserves of good milling ore. M. B. Dudley, of Kingman, was the former owner of this property and recently turned it to R. P. Davis, of 2356 Hollyridge Drive, Hollywood, Calif. Davis is the principal owner of the Alvarado mine, near Congress Junction.

▶ Harry and Lawrence DeZee are operating the Del Pasco mine under lease. The mine is situated five miles northeast of Crown King. They are shipping a carload of high-grade gold ore every month.

IDAHO

Rock Bursts at Sunshine Mine Being Studied

Preliminary investigation undertaken by Bureau of Mines—Garnet production from gravel deposit near Fernwood to be increased by erection of 50-ton plant

▶ Causes of rock-burst explosions at the Sunshine mine are being studied by Dr. Leonard Obert, of the U. S. Bureau of Mines, and Dr. P. J. Shenon, who, with R. H. McConnell, made a geological study of the Coeur d'Alene district silver belt in 1939. Dr. Olbert is engaged in making similar studies in the deep copper mines of Michigan and is at present making only a preliminary study of conditions at the Sunshine. The electro-acoustic method being employed in the Michigan mines attempts to predict at what points underground rock bursts may occur and is meeting with considerable success, according to Sunshine officials, who hope that the same methods applied to Sunshine may obtain the desired results.

▶ The Garnet Mines company has started a new industry in Idaho—that of mining commercial garnets from a gravel deposit in Latah and Benewah counties, near the town of Fernwood. The company is made up of Spokane and Seattle men, who are erecting a 50-ton milling plant designed by R. S. Handy, mill superintendent for the Bunker Hill & Sullivan company. The mill is a washing plant designed to clean and separate the garnets from the sand. The cleaned garnets are to be sacked and shipped to Seattle, where they bring from $30 to $50 a ton, officials of the company state. They are used for abrasive purposes in industry.

▶ John Mullen, who owns the Moose Creek placer property near Salmon, reports that he has made a deal with a Salt Lake company to install a dry land dredge on his property and that an effort will be made to get the equipment set up and in operation this fall.

▶ Idaho is now producing and shipping 50 tons of tungsten ore concentrates per day, according to Arthur Campbell, state mine inspector, who has just returned to Boise from an inspection trip in the Yellow Pine district of south

central Idaho. At Stibnite, a few miles above Yellow Pine, a new tungsten mine has started operations, with 180 men employed. The company has recently constructed a concentrating mill at the property and is now producing a high-grade concentrate product which is being shipped daily by truck to the railhead at Cascade.

▶ The Mineral Mountain crosscut recently started by the Polaris Mining Co. from the 2,300 level has been advanced a distance of 110 ft. into Chester ground. The crosscut will cross the Polaris fault 600 ft. from the starting point and the next 500 ft. will be through Chester ground. It will take 1,100 ft. of work to reach the Mineral Mountain property.

▶ Farmers along the Boise River in Idaho are vigorously protesting against gold-dredging operations along the river, especially between Diversion dam and the mouth of Moore's Creek. Following the report of a committee investigating the application of the Nampa Gold Dredging Co., the farmers adopted a resolution against permitting the lease to the gold-dredging company.

▶ Work is progressing on the construction of the 60-ton mill at the Grimes-Payette Mining Co. mine above Pioneerville, in the Idaho City district. The present mine was formerly known as the Grimes-Homestake and has been expanded under Shuman's management to include a total of 56 claims. He recently completed a sawmill to furnish lumber and timbers for the mine and mill. The Coon Dog mine will be opened soon, Shuman stated, and a new tunnel will be driven there. There is a big deposit of good mill ore containing lead, zinc, copper, silver, and gold.

▶ The Dayrock Mining Co. has started production from its new 200-ton mill, which has just been completed at the mine in Nine Mile Canyon. It is understood that the mine has sufficient ore blocked out to keep the present plant at capacity operations for several years. The company has a dividend record up to date of $271,438.

▶ Commercial bodies of scheelite tungsten ore have been found in the old Grunter mine, at Shoup, Lemhi County, according to Lawrence L. McLean, manager of the property. The tungsten deposit is said to have been discovered in the footwall of the gold vein, and recent development indicates there is a considerable quantity of it. The gold vein was previously under development.

▶ American Smelting & Refining Co. has completed a deal with the Aurora Mining Co., according to Henry H. Clerf, president of Aurora, whereby the A. S. & R. proposes to develop the Aurora property under a lease agreement similar to the agreement under which the smelting company is now operating the Jack Waite property. The Aurora property is on Deer Creek in the Beaver Creek section of the Coeur d'Alenes, north of Wallace. The Aurora company has driven a 3,000 ft. tunnel on the property and is reported to have opened a promising mineralized shear zone in which several oreshoots have appeared. It is this zone that the leasing company proposes to prospect on the deeper horizons with diamond-drill work.

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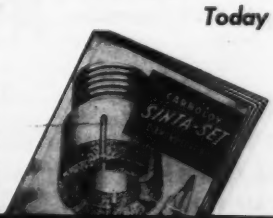

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Mining Congress Meets in San Francisco

Eighth annual session of Western Division attracts more than 2,000 operators and manufacturers

RALLYING to the general theme of "Metals for Defense," the Western Division of the American Mining Congress met in eighth annual convention in San Francisco, Monday to Thursday inclusive, Sept. 29 to Oct. 2. More than 2,000 were in attendance: 1,600 operators and 540 representatives of manufacturers. Economic problems in providing metals for national defense marked most of the sessions. But on Tuesday and Wednesday separate meetings were held for the discussion of technical matters in mining and milling. On the whole, the meeting was unusually well attended and was considered the best in recent years.

Mine safety and labor relations in the present emergency were ably presented in the opening session. James K. Richardson, safety director, Climax Molybdenum Co., emphasized the additional hazards encountered with new employees and increased production, and the necessity for closer attention by management to safety measures. Lost time means lost production that can ill be afforded. Albert W. Hawkes, president of the Chamber of Commerce of the United States, gave an inspiring address on labor relations, stressing the mutuality of interest of labor and management and the necessity of observing that mutuality in labor legislation.

The present status and outlook for various ores and metals and their part in the defense program were discussed in one session. No new striking facts were brought out, but all of the papers revealed the primary importance of the mining industry and its products. Copper was reviewed by W. S. Boyd, vice president, Nevada Consolidated Copper Corp.; zinc by W. G. Woolf, superintendent of the Electrolytic Zinc Plant of the Sullivan Mining Co.; and lead by F. E. Wormser, secretary of the Lead Industries Association. Patrick Butler, vice president, Butler Bros., discussed the record production of iron ore. Gold was reviewed by F. W. Nobs, vice president, Empire Star Mines Co., Ltd.; mercury by Gordon I. Gould, molybdenum by J. E. Wilson, antimony by R. G. Hall, and potash and borax by R. W. Mumford, American Potash & Chemical Co.

Strategic Minerals

Unusual interest attached to the session on strategic minerals, in which the whole subject of Western power production and mineral development was opened up. Bonneville and Grand Coulee power offer great attraction to the production of metals like aluminum and magnesium, which require vast quantities of cheap power. H. A. Doerner outlined the various methods for producing magnesium from brines and magnesite, with particular reference to the Bureau of Mines development of a process based on magnesite. Aluminum production from Western alunite was discussed by Frank Eichelberger, president of Kalunite, Inc. The manganese situation was reviewed by Frederick Laist, and the status of tungsten, chromium and vanadium was covered by J. R. Van Fleet.

Several sessions were devoted to governmental policies affecting the production of metals and minerals, and representatives of Washington agencies were on hand to answer innumerable questions relating to price control, priorities, and taxation. John E. Hamm, deputy administrator of the Office of Price Administration, reviewed the price policies of the Government which are of vital interest to the mining industry. Thus far more than one-third of all the price schedules issued by OPA relate to metals and minerals. The subject of priorities on mining equipment drew an exceptionally large audience to hear Dr. Shaw Livermore explain the relatively favorable position enjoyed by the mining industry with respect to priorities on new equipment and parts for repair and maintenance. Charles B. Henderson, chairman of the RFC, explained the relation of that agency to defense metals.

Taxation

In a session devoted to taxation and its effect on the mining industry, Louis S. Cates, president, Phelps Dodge Corp., pointed out the inequities in the present revenue bill, and emphasized the necessity for relief if grave injustice is to be avoided. The Excess Profits Tax was reviewed by E. C. Alvord, who presented some fresh but rather discouraging aspects of Washington's policy on this subject. D. A. Callahan urged every State mining association to maintain in Washington an active representative in tax matters. Senator R. C. Holman, of Oregon, in an unscheduled address, heartened the audience by his sympathetic understanding of the problems of the mining industry.

A symposium on recent ore discoveries in the West and the factors responsible for them occupied an entire session. Here the geologists had their day, and showed the value of geologic reasoning in finding hidden orebodies that otherwise would not have been discovered. Chance still plays a large part in many discoveries, but the scientific tools of the trained geologists are of increasing importance. Papers in the symposium were prepared by W. R. Landwehr, B. S. Butler, C. D. Hutin, N. M. Smith and John Edgar, James Boyd, and George Fowler. Participating in the discussion were Reno H. Sales, Augustus Locke, and J. W. Wade.

Resolutions passed at the convention touched on national defense, employer-employee relations, public land policy, extension of Federal control over natural resources, water pollution, primary mining securities, tariff, Federal social security program, monetary policy, Bureau of Mines and Geological Survey,

St. Lawrence waterway, government expenditures, and taxation.

At the annual banquet Walter S. Weeks, professor of mining, University of California, acted as toastmaster. The guest speaker was John J. McCloy, Assistant Secretary of War.

The separate technical sessions held on Tuesday and Wednesday were devoted to placer mining, underground conveying and loading problems, mining practice, and milling progress. All meetings enjoyed a record attendance, and ensuing discussions were interesting and instructive. The status and outlook for present-day hydraulic mining were ably discussed by J. Power Hutchins in his paper "Present-day Hydraulicking," and dragline and bucket-line dredging methods, equipment, and maintenance were covered in the paper read by H. S. Lord entitled "Developments in Dragline Methods, Equipment, and Maintenance," and in "Bucket-Line Dredge Practice," the paper presented by Norman Cleaveland. F. L. Morris presided during the Tuesday morning sessions. Under J. B. Haffner, underground conveying and loading were discussed during the afternoon session, in the absence of J. A. Wilcox. E. R. Borcherdt read his paper "Underground Mechanical Loading," giving an analysis of the use of mechanical loaders underground, and L. E. Young, in his paper "Shuttle-Car Haulage for Metal Mines," described equipment currently in use in coal mines, methods of application, and possible use of such haulage machinery in metal mines. Interesting lantern slides were used during Mr. Young's talk. A motion picture showing loading and conveying operations at the Bennett mine, Pickands Mather & Co., followed. "Block Caving by Use of Slusher Hoists and Scrapers" was the paper read by Paul J. Sirkegian, in which he discussed in detail equipment in use, and diverse operating practices at the Emma mine of Consolidated Coppermines Corp., Kimberly, Nev. Interesting discussions ensued after showing of a motion picture depicting the use of slusher hoists and scrapers at the Emma mine.

Mining Practice

The Wednesday morning session, under the chairmanship of Harlan A. Walker, was devoted to mining practice. In the absence of Lucien Eaton, George J. Young read his interesting paper on recent developments in underground drilling, blasting, and stoping; and filling in mine stopes with mill tailings as practised at the Sliger mine, in El Dorado County, Calif., was discussed in Charles W. Plumb's paper, read in his absence by H. C. Carlisle. Both presentations were supplemented by lantern slides. Charles A. Kumke presented his paper on treatment of detachable bits and drill rods and results attained at the property of Golden Queen Mining Co., Mojave, Calif. A. H. Bebee, E. R. Borcherdt, Harlan A. Walker, and others took part in the ensuing discussions.

The afternoon session was given over to milling problems, with Elmer Isern in the chair. Crushing equipment, new designs, and application were discussed in Max W. Bowen's paper, "New Developments and Equipment in Reduc-

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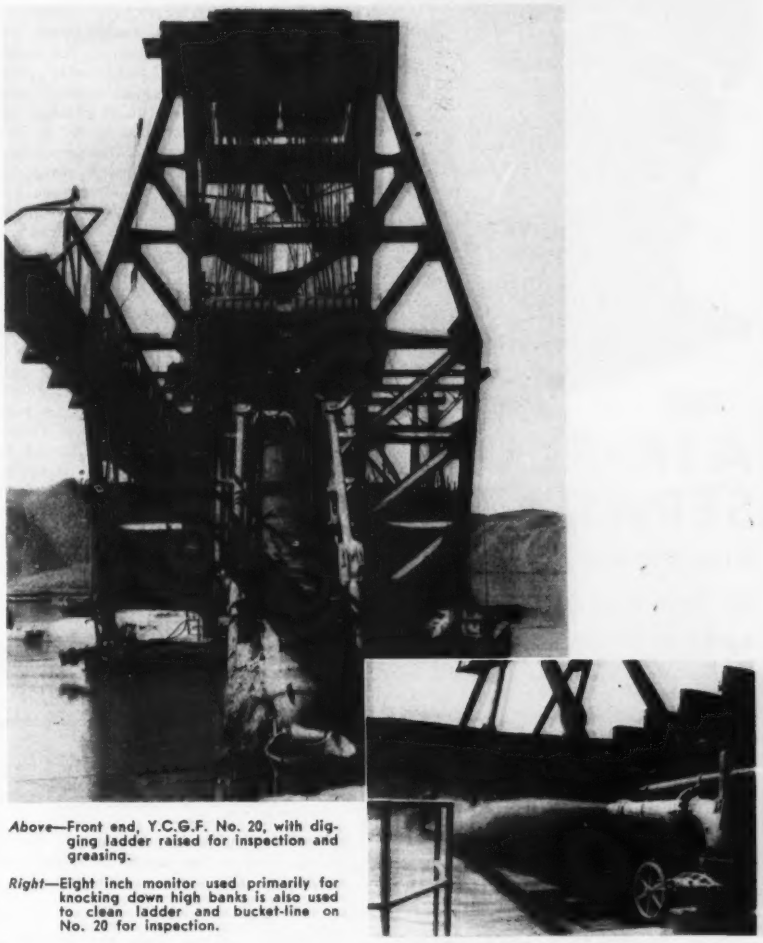

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▶MINING CONGRESS

tions Crushing," read in his absence by Merrill E. Shoup. Roy Hatch presented a paper on new developments and equipment in ball milling brought about chiefly by the necessity of rapidly increased production in recent years with existing plant facilities. Interesting operating and cost data were given. Coarse concentration with special reference to the sink-and-float process was discussed in a paper read by W. L. Zeigler. He pointed out advantages offered by adoption of the process where applicable, and further possible uses. An interesting discussion followed. In the absence of Dean A. W. Fahrenwald, Wallace G. Woolf read his paper on flotation, giving details of diverse methods of flotation and applications in the non-ferrous and non-metallic field, with Roy Hatch and others taking part in the ensuing discussion. Fred Wise gave an interesting description of milling practice at the Getchell mine, near Redhouse, Nev., and Blair Burwell, in his paper "Milling Tungsten Ore at Pine Creek," gave an interesting description of the new mill of United States Vanadium Corp., now nearing completion at the Pine Creek property, in Inyo County, Calif., and the newly evolved treatment process to be employed therein. A description of the iron detector used on conveyor belts at the mills of Utah Copper Co. was given by F. C. Green.

WASHINGTON

Aluminum Plant Starts Production

Reynolds Metals Co. expects to supply 30,000 tons of the metal annually from Longview plant

▶The new aluminum plant of the Reynolds Metals Co. at Longview, Wash., started operating during the middle of September. The plant is designed to produce 30,000 tons of aluminum annually, drawing power from Bonneville dam.

▶Good molybdenum ore is reported being mined from a level 400 ft. below the outcrop of the Deartrail Monitor mine, according to J. Richard Brown, president and manager. A drift has followed this ore 90 ft. at which point it has been crosscut and found to be 11 ft. wide.

▶Silver Bell Mining Co., 13 miles northwest of Republic, in the Sheridan camp, has driven a tunnel 350 ft. in a wide mineralized zone containing silver and gold ore of shipping grade, according to Barclay O. Goodsell, mining engineer who is directing the work.

▶Slate Creek Mining Co., in Whatcom County, in the Cascades, has four tunnels which open its property, the lowest to a depth of 1,000 ft. The total tunnel length is 9,000 ft. Gold-bearing ore is found in kidney-shaped deposits, one of which is estimated to contain 15,000 tons. Samples have indicated some ore to carry 1.34 oz. of gold to the ton. A 75-ton pilot mill saves 50 to 60 percent of the free gold and the rest is concentrated.

▶Six oreshoots are available for stoping in the property of Red Top Mining Co., in northern Stevens County, and a mill was considered at a directors' meeting recently held in Minneapolis. The ore has been opened by a 2,500-ft. tunnel. The ore contains lead, silver, zinc, and some tungsten.

▶Thomas A. Condit, manager, has started two more levels in the Chinto Mining property, five miles northeast of Chewelah. These are below the first and second levels, which were reached by a 200-ft. shaft. These new levels, one 900 ft. long and the other 1,100 ft., found the ore, which proved to be 3 to 6 ft. wide with an average value of $12.59 in silver, copper, and gold. When the fourth level has been opened the small mill will be increased to 60-ton capacity.

SOUTH DAKOTA

Low-Grade Manganese Deposit Being Exploited

Experimental plant of Bureau of Mines recovering about 5 tons of 20 percent Mn from each 500 tons of ore treated

▶Another step toward development of an emergency, domestic source of manganese was taken near Chamberlain, S. D., this month, when production was begun at the Federal Bureau of Mines experimental plant. F. D. DeVaney, metallurgist in charge, estimated that an average of 500 tons of crude ore will be processed daily until freezing weather and will be resumed again when conditions permit. The ore will be shipped to government refining plants at Boulder, Nev., and Provo, Utah, where it will be used in experiments. Admitting that the South Dakota ore is probably too low grade for use in normal times, Mr. DeVaney said the government expects to be able to develop an important emergency source of manganese in the South Dakota field.

The South Dakota deposits are believed to be the largest in the United States, although the ore is low grade. A report of the South Dakota Geological Survey, issued this year, estimates the deposits near here at ten billion tons of low-grade ore.

"The best thing about the ore in the South Dakota field is the quantity not the quality," J. H. Hedges, strategic minerals investigator for the Federal Bureau of Mines, said in describing the field.

If production costs, including the refining, are compared to cost of importing ore from Cuba and South America, the imported ore is still far cheaper than the South Dakota ore, but there appears to be some chance that further experiments may be able to cut the cost of production to a point where the domestic ore can compete with foreign manganese at least during times of emergency and rising transportation costs.

The new plant, using a system of screens and washers with an oil-heated drying kiln, will recover an average of 5 tons of 20 percent manganese from each 500 tons of material handled. Construction of a second experimental plant, designed to handle 250 tons of ore a day, has been started near Chamberlain. This second plant will operate on the principle of an explosive shattering plant similar to that used in manufacturing or processing puffed grain cereals. Ore will be placed in a steam cylinder under high pressure of steam. As the pressure is released suddenly the ore nodules will be separated from the shale and clay in which they are imbedded when mined. Both plants were authorized under funds made available by Congress for development of strategic minerals. About $80,000 is being spent on the two South Dakota plants.

ALASKA

Tungsten Ore Being Produced

Property in Hyder district accounting for small output—Ten large gold-dredging operations mark activity in Klondike district

▶The Riverside mine, in the Hyder district, is taking out tungsten ore, according to John Reed, of the U. S. Geological Survey, who has been inspecting the property. He says the mine is doing pioneer work and is the only property in that district being operated at this time.

▶Nine dredges are in full operation in the old Klondike district and a tenth will be working before the season is over, says a report from Fairbanks. The historic camp has taken on an era of life comparable to pioneer days, but with it is a different type of placer mining, from the days when pick and shovel, rocker and pan were the chief tools used. These large dredging operations are all those of Yukon Consolidated Gold Corp., Ltd. The tenth dredge will be operated on Bonanza Creek and will work for the second time ground dredge many years ago.

▶United Mining & Development Co. has shipped a third gold brick from its property on the Moose Pass and is making good progress in development. About a dozen men are employed. Charlie Harper is mine superintendent.

▶C. R. Conn and L. H. Coffield report the discovery of a wide vein of gold quartz on Black Creek, 12 miles from Denali. This is the third season the two men have spent on the property and this year they completed a crosscut through the vein. They report free gold is present in the vein. The property is in a remote district reached by plane.

▶Harold F. Haines has taken a crew from Anchorage to start the mining of chromite in the Seldovia Red Mountain district. He expects to be able to produce a substantial tonnage of this ore and will prospect for additional deposits. This district produced chromium during the first World War.

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MICHIGAN

Calumet & Hecla Obtains Ojibway Property

Operation of mines is not expected to be undertaken in immediate future—Governor appoints coordinator of mines for copper- and iron-mining districts

▶ Circuit court for the County of Keweenaw has approved the sale of the Ojibway Mining Co. property to the Calumet & Hecla Consolidated Copper Co. This was in confirmation of a bid received in a receiver's sale. Calumet & Hecla was the only bidder. The sale involves 3,000 acres, 2,000 of which are owned outright. Mineral rights only are owned in the remainder of the tract. The property was sold subject to back taxes and other liens and encumbrances. The price is sufficient to pay the debts and obligations and leaves enough for a liquidation dividend to stockholders who paid all assessments. Purchase of the property does not imply immediate operation, it is announced. It gives Calumet & Hecla ownership of the Kearsarge lode north of Seneca.

▶ Directors of Calumet & Hecla Consolidated Copper Co. have signed a lease for the Douglass lands, southwest of Ahmeek, in Keweenaw County, a 440-acre tract on the Kearsarge lode. The lands are owned by the Copper Range company. An extensive campaign of development and exploration work will be undertaken, through Ahmeek Nos. 2 and 3 shafts. In the event the work proves favorable it will greatly prolong the life of these shafts, now the most important producing units of the Calumet & Hecla.

▶ Governor VanWagoner of Michigan has appointed a coordinator of mines for the iron and copper districts and created a commission to study methods of determining assessed valuations of the mines. He has received complaints against present mine-assessment valuation methods employed by the State Tax Commission. At the request of Donald H. Nelson, Director of Priorities in Washington, the Governor created the office of coordinator and named to it Benjamin F. Sparks, Upper Peninsula engineer for the State Highway Department. Sparks' task will be to clear with the OPM each month a list of all essential materials and equipment purchased by the mines and to "report" any excessive purchases for investigation. Priority orders allow mines to purchase, direct from the source of supply, materials which are actually needed, and the co-ordinator's duty is to see that the privilege is not abused. Sparks is a former mining engineer, a graduate of the Michigan College of Mining and Technology.

▶ The Governor appointed to the Mine Assessment Study Commission Prof. C. H. Baxter, head of the mining department of Michigan Tech; Dr. W. K. Kelly, of the Michigan State College geology department; George H. Heideman, chairman of the State Board of Tax Appeals in Detroit, and Louis M. Nims, managing director of the State Tax Commission. The Governor said he expected this commission to report to him what action should be taken to correct any objectionable features involved in the present system of mine valuation.

▶ The site of the old Cherokee mine, a mile south of Greenland, in Ontonagon County, is favorable for future copper prospecting, according to a State Conservation Department report of a dip-needle survey, made by a field party led by Kiril Spiroff, of the Michigan College of Mining and Technology. The survey established that rock belts which elsewhere produce the greatest amount of copper cross the Cherokee area, which was mined from 1912 to 1917, when the mine was closed because of high material costs and a wartime shortage of labor.

IRON COUNTRY

Ore Shipments Reach 62,024,228 Tons

Above 75,000,000 tons is estimate expected for 1941 season, the highest in history—"Sentinels of Safety" trophy presented to Mahoning mine, operated by Pickands, Mather & Co.

▶ Lake Superior iron-ore shipments during September totaled 10,311,517 tons, an increase of 312,899 tons over the same period last year. Shipments for the season to date are 62,024,228. This is an increase of 13,789,001 tons over the same period of 1940. All estimates covering total shipments for the year call for at least 75,000,000 tons, which would be the largest year in the history of the Iron Ore Ranges. Iron ore is being consumed at the rate of approximately 6,500,000 tons per month.

Mesabi Range

▶ The Oliver Iron Mining Co. has commenced reducing operations at the Minnewas mine, at Virginia, Minn. This mine is approaching exhaustion. Production at the end of the 1940 season was 10,991,741 tons. Employees at the Minnewas are being put to work at the Prindle mine, also in Virginia. This mine is expected to be in production for the 1942 season. The Prindle was last operated in 1916, being held as a reserve since that time.

▶ At the sixteenth annual National Safety Competition conducted recently by the Bureau of Mines the "Sentinels of Safety" trophy for open-cut mines was awarded the Mahoning mine, operated by Pickands, Mather & Co., of Hibbing, Minn. This mine operated 508,433 man-hours during 1940 without a disabling injury. The following mines on the Mesabi Range attained honorable mention: Danube, Corsica, and Scranton mines (Pickands, Mather & Co.); Mesabi Chief (Hanna Ore Mining Co.); Susquehanna Mine (Republic Steel Corp.); Harrison Group Mines (Butler Brothers).

Gogebic

▶ Heavy rainfall early in September flooded the Wakefield mine, operated by the Wakefield Iron Co., Wakefield, Mich. The mine was idle for ten days. The Plymouth open pit operated by the Pickands-Mather company, also at Wakefield, was unable to load ore for several days because of the heavy rainfall.

Marquette Range

▶ Mining operations at the Greenwood mine of the Inland Steel Co., near Ishpeming, will be suspended for about a month, following the close of the regular shipping season, so that the company may erect its new headframe. The Greenwood shaft is down to 1,700 ft., with lowest development down to 1,500 ft.

▶ The Mather mine shaft of the Negaunee Mine Co., at Ishpeming, Mich., is nearing the 700-ft. horizon, on its way to bottom, around 3,000 ft. A steel headframe is expected to be erected early in 1942.

Menominee Range

▶ Diamond drilling has been under way on the Columbia property near Crystal Falls, Mich. The property has been inactive since 1900. Development will be carried on through the adjoining Tobin mine of the Republic Steel Corp.

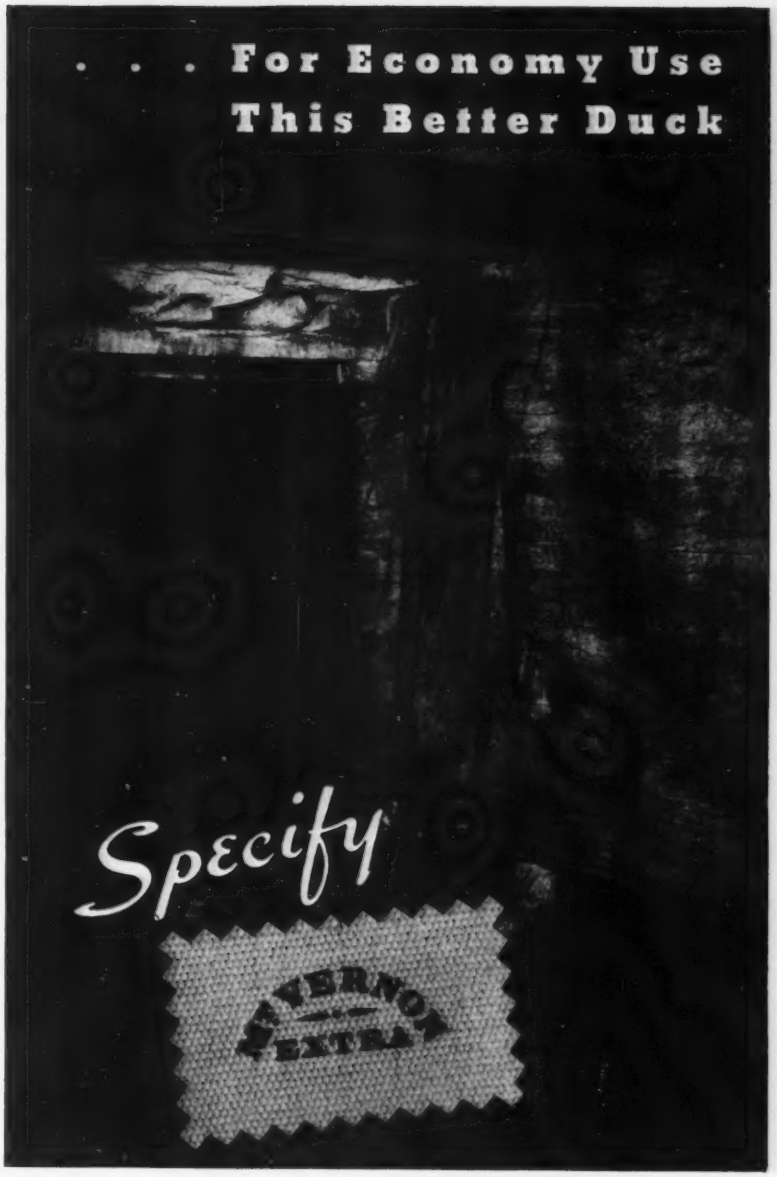
TRI-STATE

Price for Concentrates Raised Slightly

Eagle-Picher Mining & Smelting Co. increases mill contract settlement basis for zinc concentrates 58c. per ton—Promising lead-zinc deposit being developed near Baxter Springs

▶ A slight upward adjustment of 58c., from $48 to $48.58, a ton in the price of zinc concentrates occurred during September in the Tri-State district. The adjustment was made at the close of the second week in the month, after 50 weeks of the same price—the longest continuous period in the history of the mining field. The new open market price, the highest since April, 1937, conforms to the Central mill contract settlement basis of the Eagle-Picher Mining & Smelting Co., which is at the ratio of 6.70 times the average *Engineering and Mining Journal* weekly slab zinc quotation, East St. Louis, per 100 lb., that was adopted by the company in May, 1940. Production of the field held around 9,800 tons of zinc concentrates weekly during the month, which is about the peak at the present price, although the starting of the Granby properties of the Federal Mining & Smelting Co. early in October may augment the total rate.

▶ A good deposit of lead and zinc ore has been opened up by Mont Lee, of Columbus, and associates in a shaft put



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▶TRI-STATE

down on the old Discard lease, south of Baxter Springs, in Oklahoma. The ore, which was struck at a depth of 15 ft. and continued to the 30-ft. level, is being treated by the Wade custom mill near by. Associated with Lee are George McDaniels, of Galena; Everett Pliler and George Turntine, both of Baxter Springs; and W. J. Howard, of Joplin.

▶ Another place where some production may be expected in the near future is at Galena, where Fred Childress & Sons have completed the dewatering of the old Bailey shaft on the Southside tract and are finishing work preparatory to the start of mining operations and the shipment of ore to the Eagle-Picher Central mill. Eagle-Picher M. & S. Co. has leased 600 acres west of North Main St., and in the Short Creek bottoms, from the Childress group, and has several drill rigs operating in the vicinity of the old creek flume site with the idea of testing out the ore deposition for open-pit mining.

▶ Rialto Mining Corp. has shifted operations in the retreatment of tailings at the No. 2 tailing plant. Change in handling was to hoist-dragline method from loading by power shovel and haulage by truck.

▶ Another shift has been added to the schedule of milling operations at the No. 9 plant of the St. Louis Smelting & Refining Co. in the Waco mining field, according to H. H. Utley, of Baxter Springs, district superintendent. The plant, which has a capacity of 50 tons of ore rock an hour, is now being operated two shifts daily.

▶ Mining and milling operations have been resumed by the Smoky Hill Mining Co. on the original Quapaw mining lease, north of Commerce, with Louis Grimes in charge of operations.

▶ Tongaha Mining Co. has reopened a shaft on the Alexander forty of the Beaver allotment, a half-mile northwest of Cardin, and has resumed mine operations on the 270-ft. level. Ore is being trucked to the Eagle-Picher Central mill. Associated in the company are O. L. Oliphant and Clyde S. Powell, both of Galena.

MEXICO

Strikes Close Five Units of Cia. Penoles

Government strives to head off shutdown of companies' mines and refineries but is unsuccessful — President Camacho comments on the mining industry

▶ No improvement appeared in Mexican mining as fall began. Operations were of rather a routine nature, though it appears there is more capital in prospect for the business with the increasing of its capital by a bank specializing in this financing and the establishment of another mining-money institution. Difficulties in obtaining machinery and equipment from the United States continued, and so did labor troubles.

▶ Efforts of the government to head off the long-threatened strike against Peñoles failed. All five units of this company, two refineries the others mining, in Chihuahua, San Luis Potosi, Zacatecas, and Guerrero, were closed on Sept. 8. No settlement had been made up to early October.

▶ Mining was not extensively reported upon by President Manuel Avila Camacho in his first annual message to Congress on Sept. 1, as he said: "As a result of stimulation that has been accorded mining and despite difficulties caused by the war, production in that sector during the first quarter of 1941 was on the whole higher than the average in the same period of 1938 and 1939 and equaled that of the same term of 1940. From last Dec. 1 (when the new government took office) to May 31, 1941, 3,134 applications for general mining work concessions and 1,018 for exploitations in mining were filed, of which 555 of the former and 368 of the latter were granted. There are now in effect 18,221 mining exploitation concessions covering 1,638,787 hectares. My government has found it necessary to take action to prevent the incorporation of certain zones into the federal mining reserves because they constitute an obstacle to the development of exploitation. This proposition was inspired by the bases adopted for the exploitation of deposits of such fertilizers as phosphates as well as those of sulphur and the exploitation of iron in the reserves. So as to save miners of limited resources from having to sacrifice the greater part of their legitimate profits by sending their production to the large metal-treatment plants, the national commission for stimulation of the mining industry is installing two plants of this kind and has acquired two others. These are in addition to the four plants which have been functioning since last year. The combined daily production of the existing plants is 250 tons (metric), an output that is expected to be increased by 150 tons a day when the new plants are in operation."

▶ Installation of a 500-ton mill is being completed by La Azul fluorite mine, Taxco, Guerrero. This mine, which is now employing 450 men, is managed by E. J. Goeyens, Hotel de la Borda, Taxco, who is the former superintendent of the San Juan mill, Taviche, Oaxaca.

▶ Capital of the Banco Credito Minero y Mercantil, S. A., the Mexico City Bank that is backed by a syndicate of Mexican and foreign bankers and mining men, has been increased to 10,000,000 pesos ($2,150,000) so that it may widen its scope. Raul Bailleres is president of the bank.

▶ Durango is coming to the fore as a mercury and manganese producer, with increased exploitation of these minerals in the Magistral, El Cuarenta, San Fernando, Santa Maria del Oro, Sarnoso, and Cerro Blanco districts.

▶ Argentine interests are seeking Mexican sulphur in lots of 1,000 to 1,500

tons each, according to the Mexican Ministry of Foreign Relations, which is facilitating negotiations for this business. The war has deprived the Argentine of many of its sulphur supply sources.

▶The Federal Supreme Court upheld cancellation by the Ministry of National Economy of the franchise of the Sociedad Cooperativa de Consumidores Metalurgicos, S.C.L., a mining consumption cooperative society of San Luis Potosi, because it found that the society was competing unfairly with commerce by selling to persons not its members. The ruling sets a precedent in that it establishes the rule that consumption cooperative societies can do business only with their members.

▶Insurance companies are authorized by the Ministry of Finance to invest that part of their capital and reserves which the law allows for such purchasing in the 7,500,000-peso ($2,650,000) issue of mortgage bonds the Cia. Fundidora de Fierro y Acero de Monterrey, S.A., Monterrey, Nuevo Leon, Mexico's greatest iron and steel works, is marketing to finance purchase and installation of a blast furnace. Preliminary work has started for installation of this furnace, which will be both the company's second and the second in Latin America. Efforts are being made to have the new furnace, which is expected to double the company's production, in operation by the end of 1942.

▶A concession has been granted by the Ministry of Finance to Lics. Gustavo R. Velasco and Alfredo Porraz, Jr., for the organization in Mexico City of a mining financing bank. Financiera Minera, S.A., which is to begin business in the late fall with a capital of 1,000,000 pesos ($210,000).

▶The government is investigating a report involving Heinrich Raw, a German who has been active in mining for some time in southern Mexico, rendered by Delfino R. Aguilera, Mexican civilian aviator, of a clandestine airport and radio station on Raw's mining properties on an island in the Grijalva River, opposite Las Palmas, Mexcalapa municipality, Chiapas. Raw, the report declared, receives much mail and other matter by plane and operates his radio station frequently on long and short waves.

NICARAGUA

High Gold Output Expected in 1941

▶Estimates of gold production in Nicaragua during July, 1941, exceeded $667,000, against $544,050 in July last year. According to the United States Department of Commerce, mine output is expected to increase appreciably as a result of the installation of equipment recently received from the United States. If no unforeseen development prevents the continued operation of the mines, authorities believe that the exportation of gold concentrates in 1941 may exceed earlier estimates of $7,000,000 in value and thus set a new record.

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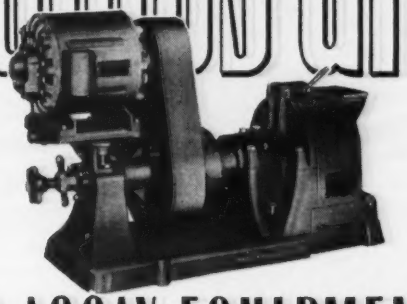

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The Chuquicamata mine of the Chile Copper Company in Chile is one of the important South American suppliers of copper for the United States defense program. The open pit shown above is about 10,000 ft. long and 3,500 ft. wide and about 800 ft. across the floor, which is about 600 ft. below the highest bench. In the left background is the crushing and leaching plant

SOUTH AMERICA

Small Mines Producing Antimony in Peru

Most of the ore is exported—Chromite deposits in Brazil being exploited

PERU

▶ A feature of the antimony industry in Peru is the operation by a number of small producers working with limited capital. During the first six months of 1941 exports of antimony ore totaled 1,532.5 metric tons with an average antimony content of 876.4 tons, or about 51.3 percent. Total exports in 1940 were 1,615 tons with an average content of approximately 54 percent antimony.

Production of tungsten in Peru averaged 18 metric tons a month with an average content of 66 percent WO_3 during the first six months of 1941, compared with a monthly average of about 23 tons totaling 280½ tons of concentrates in 1940. The present rate of output is expected to be maintained during the remainder of the year.

Mica occurs in Peru in the Camana district, Department of Arequipa, but production has been small. Clear mica is said to be available in sheets ranging up to 10 in. in size.* A trial shipment involving about a metric ton of sheet mica went to the United States in April. All mica exports, totaling 2,672 kg., were shipped to the United States during the first six months of 1941.

A commission has been appointed by the Government to review proposals for establishment of a steel industry in Peru, according to the U. S. Department of Commerce.

▶ On Oct. 2, Jesse H. Jones, Federal Loan Administrator, Washington, D. C., announced that the Metals Reserve Co. had made an agreement with Peru to purchase antimony, copper, lead, zinc, tungsten, and vanadium in the form of ores, concentrates, or metal. Such of these materials not bought by private business in the United States would be bought for government stockpiles, by the Metals Reserve Co. These arrangements with Peru make its strategic and critical materials exclusively available for countries of the Western Hemisphere.

CHILE

▶ Pending final action on the new contract to acquire additional large tonnages of Latin American copper, producers in Chile have consented to ship to Metals Reserve a total of about 65,000 tons during October and November. The price is said to be 11¼c., United States ports.

BRAZIL

▶ Exports of chromite from Brazil rose sharply in May, when shipments totaled 1,219,200 kg., valued at 357,657 milreis, against 416,560 kg., valued at 101,577 milreis, during the first four months of 1941. Total exports of chromite in 1940 were 572,000 kg., of which the United States took 4,064,000 kg. and Germany 508,000.

▶ Near Areal, Municipio de Parahyba do Sul, State of Rio de Janeiro, there are reported to be small deposits of nickel occurring in irregular masses, the richer ore being near the surface. According to a Department of Commerce report, the ore is said to appear similar to the Livamento nickel ore; that is, capable of being treated in an electric furnace for making ferro-nickel. Power is available from the Brazilian Hydroelectric Power Co., whose line runs a short distance from Areal.

JAPAN

Copper Deposit Being Developed In Chosen

▶ A deposit of ore said to average 1.4 percent copper is reported being developed in Kanan, North Keisho Province, Chosen. A mill, eventually having a capacity of 500 tons per day, is projected to concentrate the ore. At Shiko, Keiki Province, a copper refinery is planned to be erected.

The Government General is reported to have arranged for the granting of subsidies to encourage the development of the Chosen mining industry to supply industries most needed to supplement the present economy of the Japanese Empire. The Chosen light metal industry, chiefly the Japan Magnesite Co. and the Chosen Riken Metals Co., has been subsidized to the extent of 440,000 yen (about $103,136) for the 1941–42 fiscal year.

SWEDEN

Lead and Zinc Deposits Being Developed

▶ The Boliden Mining Co. will soon start mining lead ore and refining the metal, to recoup at least partly the dwindling lead supply, according to a U. S. Department of Commerce report. The company acquired extensive holdings in 1940 at Laisvall, in northern Sweden,

on which a concentrating plant will be erected. The concentrates will be taken to Skellefted for smelting at the Ronnskar works.

Although strict economy in the use of metals is practiced, Sweden is making every effort to increase its supply. An aluminum mill now under construction is expected to be completed in 1942. Production of copper is being increased, and plans are under way to develop some zinc deposits.

SPAIN

Tin and Tungsten Deposits Being Exploited

▶ Small amounts of tin and tungsten are being produced in Spain. During the first four months of 1941 there were produced, according to the U. S. Department of Commerce, 113 tons of wolframite, 76 tons of tin ore, and 15 tons of metallic tin. The figure on wolframite production is much smaller than estimates made by well-informed members of the trade, who say that monthly output exceeds 60 tons, with most of this output being exported to Germany, according to reliable sources.

Production of other minerals and metals during the first four months of 1941 include 23,474 metric tons of zinc ore and 4,042 tons of metallic zinc; 2,012 tons of manganese ore; 13,644 tons of lead ore and 12,533 tons of metallic lead; 35,783 tons of copper ore; 670 tons blister; 2,467 tons of regulus and 1,967 tons of refined copper. Practically all of the zinc ore not required for domestic consumption is now being shipped to Germany. The company operating the important zinc deposits in Santander has been supplying about 5,000 tons of zinc ore a month to Germany.

CANADA

Conciliation Board To Hear Labor Unions

Evidence in dissension over recognition of two workers' organizations in Kirkland Lake gold-mining camps is brought to Department of Labor

▶ The aroused patriotic spirit of Kirkland Lake and Timmins, where the percentage of men enlisting leads all Canada, is giving opposition to American organizers for the C.I.O. Evidence in the dispute over union recognition is to be heard by a board of conciliation that has been authorized by the Department of Labor. J. L. Cohen, K. C., Toronto lawyer, represents the Kirkland Lake Mine, Mill and Smelter Workers Union No. 240, and Frank Wilkinson, K. C., represents twelve Kirkland Lake mining companies. Justice C. P. McTague has been appointed chairman by the Hon. Norman McLarty, Federal Minister of Labor. Sittings of the board are expected to start early in October. Efforts failed to hold a one-day "holiday" of

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▶CANADA

mines in both Porcupine and Kirkland Lake on Labor Day, as a union demonstration. Appointment of the conciliation board was made after representatives of the C.I.O. union had met the Minister of Labor and the Hon. T. A. Crerar, Minister of Mines and Natural Resources. The union rejected the proposal that committees of workmen be formed at each mine and that the cost-of-living bonus be revised. The union has held out for collective bargaining exclusively with union men. Order-in-Council 7440 sets up a system of cost-of-living bonuses as a method for keeping wages adjusted to rising commodity prices. Any action on wage rates by the conciliation board will have to be regulated by the provision of the Order-in-Council for a bonus of 25c. a week for every point increase in the economic index of the Dominion Bureau of Statistics. A second Order-in-Council imposes penalties for agitators who organize or take part in illegal strikes.

▶In September, renewed contracts went into effect between base-metal producers, the British Ministry of Supply, and the Canadian Government. The agreement holds for the next 12 months and involves no change in prices, although this may be negotiated later. The original agreement was entered into at the outbreak of war and had the effect of pegging metal prices on British purchases, amounting to about 80 percent of Canada's base-metal output.

▶Development of strategic materials in eastern Canada is making slow progress. Noranda Mines has advanced $400,000 to Canada China Clay & Silica; additional finances are to be provided by the N. A. Timmins Corp. to Chromium Mining & Smelting Corp., following the reorganization of capital set-up by both operators.

▶In New Brunswick, Abco Mines, at Elgin, started its 100-ton manganese concentrator in August; a second mill of the same size, near Sussex, went into operation in September.

ONTARIO

▶The old Murphy property, east of Kirkland Lake and adjoining Upper Canada Mines on the south, has been taken over by Queenston Gold Mines. Important results have been secured from the first two drill holes in the new program for systematic exploration. No. 1 hole intersected $6.09 ore 62.5 ft. in width. The No. 2 hole, cut 30.4 ft. that graded $10.60 a ton. R. R. Brown, president of Upper Canada, heads the new company.

▶Tyranite Mines, subsidiary of Sylvanite Gold Mines, has started deepening the main shaft from 825 to 1,125 ft. The property is in the Matachewan camp southeast of Kirkland Lake. W. D. Stroud is mine manager.

▶Another successful producer controlled by Sylvanite, Delnite Mines, operating two miles south of Hollinger, is developing a new level at 1,625 ft. Last year the mill was enlarged to a daily capacity of 400 tons, treating ore averaging $6.84 a ton. John Beattie is mine manager.

▶A mill increase has been officially announced by McLeod-Cockshutt Gold Mines, in the Little Long Lac camp. Capacity is to be enlarged from 700 to 1,000 tons a day, with provision for later expansion to 1,500 tons. Advance development has proved large tonnages, following a $400,000 campaign of exploration on both the north and west zones. With the enlarged mill the average grade is estimated at better than $9.25 a ton. Joseph Errington is vice president and managing director and J. M. Kilpatrick is mine manager.

▶The Ross mine of Hollinger Consolidated, located in the Ramore area east of Porcupine, is the center of an exploratory campaign that is beginnnig to show results. The 300-ton Ross mill continues normal operations, with underground development down to 900 ft. Two new levels are being opened up.

▶Bidgood Kirkland Gold Mines is carrying exploration of veins No. 12 and 14 to a depth of 1,275 ft. Although the milling rate has been lowered, gold recovery has improved. In the first seven months of 1940 the average recovery was $7.41 a ton, compared with $11.12 this year and $14.51 for the month of July. Frank L. Smith is mine manager.

▶Wendigo Gold Mines, a gold-copper producer 22 miles south of Kenora, Lake of the Woods district, has put down a winze from the 1,100-ft. level to a depth of 1,750 ft. Four levels are to be opened at 150-ft. intervals. Horace G. Young, president, reports production from the 110-ton mill at an all-time high level, with operating costs, before taxes, reduced. K. R. North is mine manager.

QUEBEC

▶Chromite Limited, operating a mine at St. Cyr, Quebec, Canada, has started shipping ore at the rate of two cars a week to the Chromium Mining & Smelting Co., Sault Ste. Marie, Ontario. Production is being increased to 3 cars a month. Construction of a mill is under way having started early in October.

▶McWatters Gold Mines, 7 miles east of Noranda, has been rewarded in its long search for new ore by the discovery of a promising section on the 900 level, 2,600 ft. to the east of the winze. The orebody has been developed for a length of 175 ft. and is still open at the east end. William J. Hosking is mine manager.

▶The downward continuation of flat-lying quartz-tourmaline orebodies has been traced by Central Cadillac Gold Mines to a vertical depth of 575 ft. At this point development work was started in September on the new sixth level, following success in opening ore on the intermediate fifth level. More headings in ore are being maintained than formerly, in an effort to work into a safer position for mill requirements. Peak production is 150 tons a day, but a sorting plant is to be put into use in October to augment the average bullion output of $1,000 a day. It will also be possible to clean out some low-grade material left in old stopes. The ore is

trucked two miles to the leased mill of Thompson Cadillac Gold Mines, now in liquidation. Gerald A. McTeigue is president and J. H. Evans mine manager.

BRITISH COLUMBIA

▶ The new low-level crosscut being driven by Central Zeballos Gold Mines, Ltd., is expected to reach its objective soon. It is on a horizon 700 ft. below the upper adit level and 400 ft. below the bottom of the winze from No. 4 level. Operating costs are expected to be cut from $2 to $3 per ton on the completion of this work through the elimination of raising, pumping, and tramming. The crosscut intersected a vein, 8 in. wide, assaying 1.53 oz. gold per ton, at least 200 ft. before the point at which the downward extension of the "Main" vein was expected. No exploration of the new vein will be made at present, as every effort is being made to effect an early completion of the crosscut.

▶ Proof of the downward continuation of the Prident orebodies has led Privateer Mine, Ltd., to drive a crosscut from the No. 6 (Privateer) level, an estimated 1,180 ft., into the Prident property. Besides eliminating the need for sinking at the Prident, the new crosscut will provide a direct underground haulage for ore to the Privateer mill.

▶ During the quarter ended Aug. 31, 1941, Spud Valley Gold Mines, Ltd., had production valued at $132,625 from 8,586 tons, averaging $15.45 per ton. Plans call for the doubling of the original 60-ton capacity. Construction of the tramway, connecting the North Star property with one of the Spud Valley tunnels, is proceeding as rapidly as possible.

▶ Premier Gold Mining Co., Ltd., has announced that the October dividend will be reduced from 3c. to 2c. per share.

▶ A 50-ton mill is being installed at the property of Musketeer Mines, Ltd., a subsidiary operation of Pioneer Gold Mines of B. C., Ltd. A permanent camp has been built at the mine, and hydroelectric power has been developed. An effort will be made to bring the property into production this year.

▶ Shareholders of Minto Gold Mines, Ltd., have ratified an agreement whereby Pioneer Gold Mines of B. C., Ltd., will acquire an option on an 80 percent interest in the Minto (Bridge River) property. It is understood that intensive exploration and development will be undertaken in an effort to bring the mine again into production.

YUKON

▶ The dragline operation of Canadian Tungsten, Ltd., on Britannia Creek is handling 300 cu. yd. daily. Recovery is reported to run high per cubic yard in gold and $7.50 in tungsten. A new separation table has been installed to effect better recovery of tungsten. A permanent camp is being constructed. The company, which was incorporated only this year, plans to change to a hydraulic operation in 1942.

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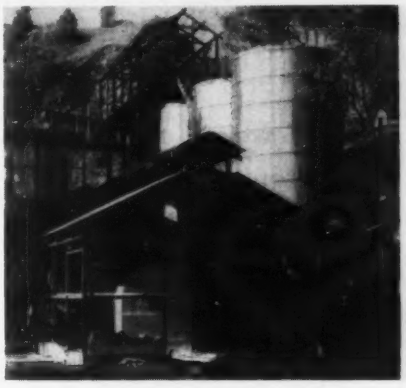

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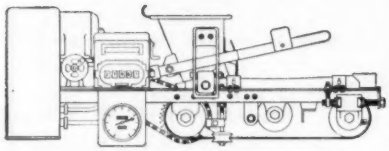

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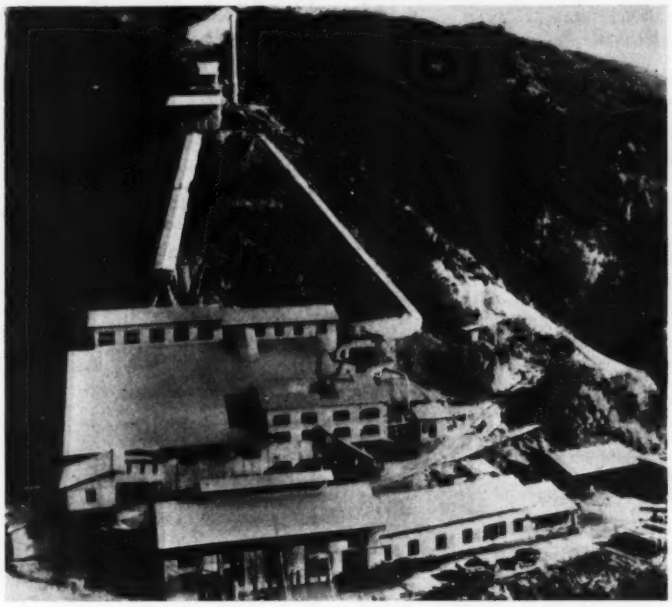

Lepanto Consolidated Mining Company is the leading copper producer in the Philippines. The Mace sintering and smelting unit, adjoining the mill at the right center, treats the concentrates that are high in arsenic and sulphur. Copper matte from the plant is shipped to the United States

PHILIPPINES

High Gold Production Expected This Year

Mining companies speeding output in case equipment and supplies are cut off by war.—A 1,000-ton concentrator is being erected by Acoje Mining Co. to treat chrome ore

▶ Gold production, in 1941, based on the first six months of this year, indicates a new record that may exceed 80,000,000 pesos. Value of monthly output is averaging about 7,000,000 pesos. Part of this increase is due to the sensational gold deposits being mined by the Mindanao Mother Lode in Surigao. This property, formerly a modest gold producer, developed early in the year an extremely high-grade orebody on the 540- and 700-ft. levels. Sensational assays have occurred with sufficient persistence that they could not be called specimen assays. Finding this high-grade ore in depth is said to be evidence contrary to views held by some geologists that the small, narrow veins of epithermal origin in the Philippine Islands would not extend in depth. Subsequent mill recovery of gold during June of this high grade indicated that 703,000 pesos was obtained from 6,596 tons, and even a higher value was obtained in July.

▶ Production of chrome ore at the Acoje mine of the Acoje Mining Co., in Zambales Province, is increasing. This property has advanced from a comparatively small producer of high-grade ore to mining 15,000 to 18,000 tons a month. The mine is one of the largest employers of labor in the Philippines and has about 3,000 men on its payroll. A 1,000-ton concentrating plant is being erected and is scheduled to begin operations Jan. 1, 1942.

▶ Mining companies are believed anxious to speed gold production, due to uncertainty of continued delivery of essential supplies that may be cut off by the war. Production costs have held to average, but some companies reported lower costs in 1940 than in 1939. Labor efficiency has improved considerably at many properties.

▶ One of the first Philippine gold mines to produce gold, the Ipo mine of Ipo Gold Mines, Inc., recently shut down owing to ore exhaustion. The property was located in 1929, and the 150-ton mill was completed in February 1934.

▶ Continued shipments of iron ore to Japan are reported, under a quota system which amounts to around 900,000 tons of iron ore a year. This, however, is about 60 percent of normal shipments. Observers believe this arrangement would be suspended if the Eastern situation becomes more tense. Lack of ships is a bottleneck, as Japan must furnish the bottoms. No copper is being shipped to Japan under export control. Lepanto, the leading copper producer, started a smelter last year, and matte is shipped to the United States. Hixbar, the next important producer, mined low-grade copper ore that had a market in Japan, but operations have been suspended at this property.

▶ Manganese mining is being speeded in Busuanga. Estimates of a 1941 output around 75,000 tons are being made. All manganese ore produced in the Islands is shipped to the United States.

AUSTRALIA

Gold Mines Begin To Feel Labor Shortage

Skilled miners being absorbed by munitions industries—Asbestos deposits in Western Australia are to be developed

WESTERN AUSTRALIA

▶ The gold yield for the State for the month of June, 1941, was 83,502 oz., valued at £A893,463, which shows a decrease in comparison with that for May, when 91,438 oz. were reported. While the closing of the Lancefield mine, through a cave-in, involving the main shaft, has affected the output, the decrease is largely caused by the growing shortage of labor, due to enlistment of skilled mine workers and absorption in the many branches of munition work. The difficulty in obtaining adequate labor is regarded seriously by the State Government and the Chamber of Mines, and the Commonwealth Government has been consulted with a view to more satisfactory operation of the regulations controlling man power.

▶ The estimated profit of South Kalgurli Consolidated, Ltd., which is operating at Kalgoorlie, for the year ended March 31, is £A52,062. During the year 98,355 short tons of the company's ore and 22,810 tons of purchased ore was milled, and 18,148 tons of residues was retreated. Extensive development is in progress and satisfactory extensions and some new shoots have been located. Ore reserves do not warrant the modernizing of the mill as a whole, though some sections have been reorganized. The mine is now the only one on the field employing dry crushing and roasting, and though costs are higher than on those mines operating flotation plants, the concentrate being roasted in Edwards furnaces, the over-all recovery is from 3 to 4 percent higher than is obtained by the more modern treatment.

▶ Consolidated Gold Areas, N.L., at Hampton Plains, 26 miles south of Kalgoorlie, incurred a loss of £A571 for the year ended Dec. 31, 1940. The lode has not yet been opened up sufficiently to permit its operation to best advantage. The oreshoot, 550 ft. long with a mean width of 10 ft., occurs in greenstone. Working is by shrinkage stoping. The deepest level is at 420 ft. from surface and shows a considerable length of ore worth 8 dwt. per ton, the average grade of the mine being 5.25 dwt. per ton.

▶ Asbestos has been mined in a small way in the Hamersley Ranges in the northwest of the State for some years. It occurs in an area 180 miles long and a width varying from 20 to 30 miles. The fiber is of excellent length and quality and occurs in conformable seams in horizontally bedded ferruginous quartzites and shales, with thin bands of dolomite, and is found usually in close proximity to the dolomite. In view of the extensive nature of the occurrence and the high grade of the fiber, it is anticipated that much greater attention will be given to this region.

VICTORIA

▶ The leading gold producer in the State is Victoria Gold Dredging Co., N. L., which is working on the Loddon River flats at Newstead. The company's year to March 31, 1941, was satisfactory, the net profit earned being £A150,808. Dividends amounted to £A137,500. Resoiling is part of the dredging operation. The gold recovery during the year was 75.5 percent of the bore values within the area worked. The wash is free and the bottom is either fairly soft bedrock or coarse barren drift, which gives good conditions throughout.

NEW SOUTH WALES

▶ The gold yield for the State for the five months to the end of May was 32,669 oz., valued at £A349,562. This is a decrease when compared with the return for the corresponding period of 1940, when 38,546 oz., worth £A410,774, were recorded. The yield for the month of May was 5,499 oz. or 2,272 oz. less than in May 1940. The reason for the decrease is largely that prevailing through the rest of Australia—shortage of labor due to enlistments and to men leaving the mines for munition work in the cities.

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AFRICA

Mill to Be Built At Blyvoor Mine

Plant on the West Rand will be of small capacity owing to present tax program—Favorable development continues at other properties on West Witwatersrand

▶ Blyvooruitzicht Gold Mining Co., which is developing exceptionally high values in the Carbon Leader bed at a depth of over 4,500 ft. in the West Witwatersrand area, has decided to proceed immediately with the erection of a reduction plant of 8,000 tons per month capacity. It is remarked that this is going back to the early Witwatersrand days when new mining undertakings erected small mills and paid for equipment largely out of earnings. Everybody seems to have overlooked the fact that Blyvooruitzicht's action is an adaptation of policy to the prevailing excessively high taxation of profits and most difficult capital market. The small mill is intended to treat the ore broken in development work, and as it is expected to yield at least an ounce per ton, it will diminish the demand for new capital from shareholders by helping to supply the needed capital from the mine.

▶ The prospects of the West Witwatersrand mines are still matters of speculation, despite the developments in Blyvooruitzicht having greatly encouraged the optimistically inclined. Geographically, the favorable developments in the new western area are widely separated. Libanon, which adjoins Venterspost on the west, both now established producers, is 10 miles east of Blyvooruitzicht. Western Reefs, now being equipped for production, is farther on, 100 miles southwest from Johannesburg, and Western Holdings is 50 miles south from Western Reefs. At these widely separated points good values have been disclosed by diamond drilling or underground development. Geologically there is a great difference, too. Libanon and Venterspost are working on an extension of the Main Reef series of deposits. Between Libanon and Blyvooruitzicht there is a big fault, and the Carbon Leader, on which the latter and all other farther west interest is centered, is considered to be geologically thousands of feet higher than the Main Reef series. So it is that the West Witwatersrand region, though an extension geographically of the great Witwatersrand, is geologically a new discovery. The considerable tonnage of good ore already developed by Western Reefs, the remarkably favorable initial development results obtained by Blyvooruitzicht and the excellent drill cores obtained by the other companies mentioned, however, give reason for the expectation that the wide gaps between the few discoveries will all be given attention when conditions warrant.

▶ Another of the new Witwatersrand companies, Venterspost Gold Mining, only seven years old, increased its developed ore reserves by 315,000 tons last year, to 2,714,000 tons averaging 4.4 dwt. per ton over 93.4 in. The values are the same though the width has been increased by 4.3 in.

▶ Sub Nigel, one of the leading Witwatersrand producers, increased its ore reserves by 223,000 tons last year, to 3,080,000 tons. The average width, 34.1 in., is 1.6 in. greater and the average value, 13 dwt. per ton, is 0.3 dwt. lower than the estimate put out a year ago.

▶ The gold output of the Transvaal (chiefly Witwatersrand) in June was 1,181,255 oz. This was 37,813 oz. less than the record output in May, which had one more day, but was 23,249 oz. greater than in June, 1940. The number of natives employed by the gold-mining industry decreased by 3,427 during May, to a total of 363,157, this being less than 1 percent.

▶ Owner of a considerable interest in Roan Antelope and Rhodesian Selection Trust, the Union Corporation has called attention to the different way in which the 100 percent excess-profits tax affects these two companies. Mufulira Copper Mines, on which Rhodesian Selection Trust depends for its income (owning 64.07 percent of Mufulira's shares), increased its earnings by 59½ percent last year, but was obliged to reduce its dividend because of two-thirds of its total profits being required for taxes. This necessitated a reduction, from 10d. to 8d., in Rhodesian Selection Trust's dividend. The Union Corporation statement concludes: "Roan Antelope also earned a much increased net profit, but contrary to the Mufulira experience, it was able to raise the dividend from 9d. to 1s., as it fortunately does not suffer so much from the peculiarities and incidence of the excess-profits tax." This condition comes about through the law being based on an assumption that any amount earned in excess of the amount earned in years immediately before the outbreak of war is war profit. In those years Roan Antelope was already an established large producer and a dividend payer, and Mufulira was just starting production on a very small scale. Several other mining companies are in the same position as Mufulira. There can be no doubt that justice will be done these companies eventually, the excess of the excess-profits tax probably being refunded.

▶ Tanganyiko Minerals, formed in 1935 to develop two properties in the Lupa district of Tanganyika Territory, and for some time a producer, is going into voluntary liquidation. There will be no assets for distribution to the shareholders.

▶ Later advices from Blyvooruitzicht state that the first drift along the Carbon Leader, which averaged 72.4 dwt. over 16½ in. for a distance of 185 ft., has been extended a further 20 ft. The values disclosed raise the average for the full 205 ft. to 82.5 dwt., width unchanged. The east drift is the richer, 105 ft. of it averaging 108.1 dwt. per ton, the 100 ft. west averaging 54.2 dwt.

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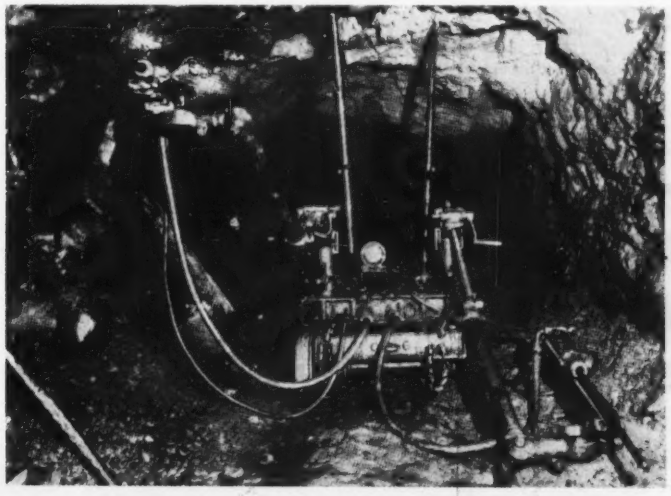
EQUIPMENT NEWS

New Developments in Mining Equipment Shown at San Francisco

Many manufacturers exhibit machinery to improve mining efficiency and speed production of metals for national defense

MINE OWNERS, executives, and operators attending the Eighth Annual Metal Mining Convention, American Mining Congress, at the Fairmont Hotel, San Francisco, Calif., Sept. 29 to Oct. 2, to discuss problems confronting the mining industry under the present emergency, found the machinery exposition of more than ordinary interest and importance. More than 50 manufacturers of mining equipment took part in the exhibit, which very well measured up in size and quality with others held in the past. It enjoyed a record attendance during the entire convention, and again new developments in mining and milling machinery and new materials were shown in attractively laid out booths, with a large number of equipment units and scale models in actual operation.



A rig, mounted on mine-car trucks, designed to position from one to three rock drills easily and quickly for angle drilling, was announced by The Cleveland Rock Drill Co., Cleveland, Ohio.

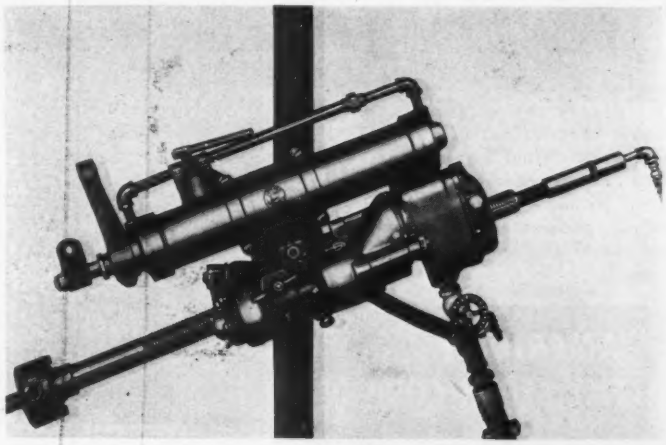
The Cleveland Rock Drill Co., Cleveland, Ohio, displayed a revolutionary design of drill-supporting mechanism called by the manufacturer the Model MDR mining machine. The rig is designed to take care of one, two, or three drifters. The idea being to accurately and quickly position the drifter easily, for proper spacing for angle drilling, and the unit is generally mounted on an ordinary mine car. Built into its base are the air and water manifolds, individual line oilers for each drifter, and the worm-actuated screws used for setting the drill supporting arms, air and water-control valves and drain cocks. Advantages listed by the manufacturer over the usual column mounting are (1) much quicker and safer setting up and tearing down of the drifter; (2) prevents excessive wear and tear on the drills; (3) accurate spacing in angle drill holes; (4) saves operator the heavy lifting and resulting fatigue attendant upon the usual column mountings; (5) quick and easy withdrawal from the face when ready to blast; and (6) facility with which the whole mechanism can be shifted to another face so that drilling can proceeed while blasting operation is taking place.

New equipment displayed by the Gardner-Denver Co., Quincy, Ill., were its CF89H continues-feed drifter and the new D73 crank-fed drifting drill. Some of the features pointed out by the manufacturer about its new CH89H drill are: the motor is built into the drill, affording less vibration; the feed motor draws air from its main inlet of the drill, elminating the extra hose; the feed motor is lubricated from the oil liner; and the reciprocating movement of a double acting piston is translated into rotation of the feed nut through a simple system of rifles and pawls.

New drills displayed by the Gardner-Denver Co., Quincy, Ill., were its CH89H continuous-feed drifter and its crank-fed D 73 drifter drill respectively shown below.

Sullivan Machinery Co.'s new dual valve 3½-in. drifter.

The Sullivan Machinery Co., Michigan City, Ind., exhibited a completely new Dual-Valve 3½-in. bore drifter. Two improved stoper-type drills were also shown. The company's Safe-T stoper was featured with new and larger feed leg. A new portable scraper holder, the S-211, weighing only 250 lb., with either electric or "turbinair" motor, was also shown. The Sullivan improved No. 6 one-man core drill for use underground was on exhibit, as well as the company's



New No. 5 air-operated diamond-core drill by the Chicago Pneumatic Tool Co., New York, N. Y.

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FLEXIBLE

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No matter what your conditions may be, MINE VENT will furnish inexpensive, dependable, ventilation for you . . . Rapidly installed by use of the newly developed demountable split coupling.

This new coupling has everything the mine or tunnel foreman has wanted . . . ease of installation . . . nothing to wear out, bend or break . . . positive action insuring a neat, quick and leak proof connection.

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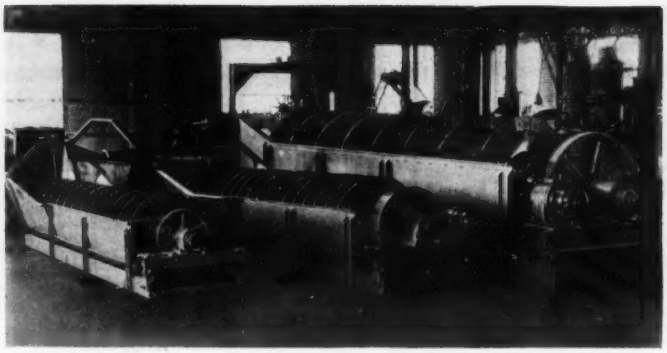


Three sizes of screen classifiers of the Western Machinery Co., San Francisco, are shown above. Meehanite cut-tooth gears that run in oil, are employed by the manufacturer in these classifiers.

new electrically driven "Torpedo" blast-hole drill.

Western Machinery Co., San Francisco, featured its 16-in. screw classifier, which is finding wide acceptance throughout the industry. Sections showed the lubrication system of the oversize, improved bearings; one section showed a grease pack submerged; anti-friction ball bearings with the company's automatic packing take-up: and the other section showed a combination babbited sleeve and ball bearing taking full bearing and thrust loads. The gears of these classifiers are cut-tooth Meehanite running in oil, and the screw flights are protected with replacable high-alloy shoes. Of considerable interest was the company's new diaphragm pump. Outstanding features incorporated in its design are accessibility and ease of operation. As to the latter, both valves are accessible in a few seconds by just loosening two bolts; diaphragm assembly is out from under shaft and fames; drive is out in the open, easily reached and adjusted when needed; and eccentric is "right before you" on the end of the shaft. In the matter of operation there are quick change of ball valves and seats; quick change of diaphragm, which can be swung to one side for unbolting; adjustable running eccentric for changing stroke; sturdy construction assuring maximum continuous operation; and no heavy parts to handle in making changes of wearing parts.

Atlas Powder Co., Wilmington, Del., displayed its recently developed complete series of mining explosives, said to have a new balance of strength and speed, known as the Atlas "Amodyns"

The Sullivan "Torpedo" electrically-driven core drill for drilling blast holes is shown above operating on the property of Pend Oreille Mines & Milling Co., Metaline Falls, Wash.

and said to be low-density ammonium nitrate type of explosives. They are made in high-velocity series, six grades, and low-velocity series of six grades.

The General Electric Co., Schenectady, N. Y., features some of its equipment available for speeding production in metal mines. The exhibit featured operating demonstrations of the G. E. Tri-Clad motor hook-on volt ammeter and air-circuit breaker.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., exhibited its new a.c. adjustable speed drive operating a flotation cell, powered by a 5-hp. vertically mounted motor. The company also featured its small storage-battery haulage locomotive, weighing only 1½ tons, operated by a 5-hp. 40-v. d.c. traction motor.

Victaulic Company of America, New York, N. Y., demonstrated with several motor-driven operating models the speed, flexibility, and tightness of its couplings used for water supply, compressed air, and pumping mill solutions. Included in the exhibit were several unique time and money savers, such as the company's adjustable elbow, which is readily swiveled on the job for any angle from zero to 45 deg.

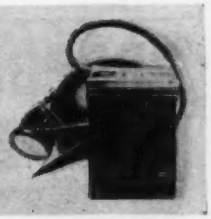
Oliver United Filters, Inc., New York, N. Y., featured its new diaphragm slurry pump. It has the unique feature of being actuated without mechanical linkage or other mechanical connections to the diaphragm. The timed impulse is applied by compressed air or vacuum directly to one side of a floating diaphragm, and through this the energy is transmitted to the slurry or solution being handled on the other side. This simplicity of design and operation indicates exceptionally long life for the pump and low maintenance costs.

The E. D. Bullard Co., of San Francisco, exhibited its new safety equipment and supplies. Material that was three years in the development stage was displayed, which is now available in the company's new airline hard-boiled hat. The material is composed of strong, light fibers, bound together with synthetic resin. This construction is said to make the hat impervious to moisture and live steam, without sacrificing its light weight. A protective plastic insole that provides flexibility and comfort for rubber boots and shoe-puncture resistance was also shown.

Pacific Foundry Co., Ltd., of San Francisco, features in its exhibit a model of the new Nichols-Herreshoff all-roasting furnace. The working model was arranged to convey material through it, which was observed through a transparent lucite wall. Samples of raw and treated ores and concentrates were on exhibit, and furnished visitors with knowledge of the many applications of the multiple-hearth furnace in the mining field.

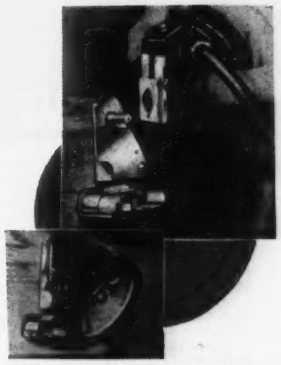
New Products by the Mine Safety Appliance Co., Pittsburgh, Pa., included Cool Bands, "Telephone Mask," and Skull-Guard Eyeshield Combinations. Various types of Exide-Iron-Clad batteries used for metal-mine service in locomotives, trammers, and shuttle cars, represented by cut-away cells, were exhibited by the Electric Storage Battery Co., Philadelphia, Pa. Link-Belt Co., Chicago, Ill., featured its new line of rubber-tired idlers for supporting the

WHEAT for BETTER LIGHT



Engineered for EASY CHARGING

Self-Service in the Lamp House



No need to take this lamp apart to charge. Nothing to disconnect on battery, headpiece or cord. Just slip keyhole in headpiece over key in charging rack—give it a twist of wrist and charging starts. Twist in opposite direction stops charge, releases lamp, leaves all contacts dead. Foolproof! This simplicity also means great space-saving in Lamp House.

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"Just a twist of the wrist"

Write for detailed fully descriptive printed matter today.

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BETTER LIGHT · LESS WEIGHT NON SPILLABLE

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SET IN VANKOLITE, the perfect Bit-Metal

Achieve the lowest diamond cost per foot with HI-CASTE Diamond Bits. Set at *low temperature* by Smit's patented, exclusive method, the stones are protected against heat damage in setting.

You can get HI-CASTE Diamond Bits in flat-faced and double-round-nose types. Also upon request, any other standard shape, size, wall thickness, or thread. Write for descriptive literature.

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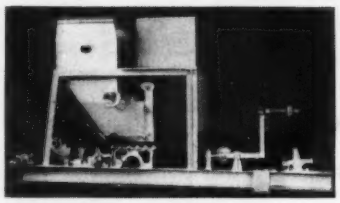
2 Heat injury to Diamonds eliminated through Patented Hi-Caste Setting method
3 Diamonds securely mounted
4 More and Smaller Diamonds
5 Sounder Diamonds at a lower price
6 More Cutting Points give Faster Drilling
7 Diamond Losses reduced by low pressure setting

J. K. SMIT & SONS, INC.

157 CHAMBERS ST. NEW YORK CITY

PROPORTION BY WEIGHT



The electrically controlled Poidometer has shown unusual accuracy in handling stone, ore, and other material where there is considerable constant variation in size. It is, also, very efficient and self adjusting when the size of the material varies over a period of time. The motor operated regulating gate, controlling the feed of material, responds instantly to a change of weight on the belt scale platform. The Poidometer construction is rigid and durable—the bearings are dust tight, with alemite fittings for proper lubrication —all sensitive operating parts are fully enclosed. The conveying part of the Poidometer may be made any length up to 35 feet.

The amount of material delivered may be varied by applying the desired weight on the scale beam and at the same time adjusting the average height of the regulating gate.

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Schaffer Poidometer Co.

2828 Smallman St. Pittsburgh, Pa.

This Booklet may help you speed Production!

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SENT FREE! Contains many useful suggestions on how to keep men working in dusty, confined places healthy and efficient with hoods, masks and inexpensive air purifiers.

Send me booklet entitled "Packaged Fresh Air." There is no obligation on my part.

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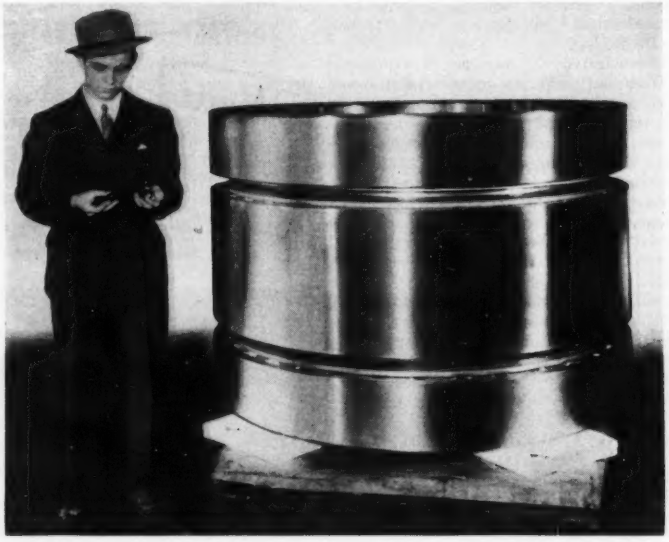
NATIONWIDE SALES AND STOCKS

return of 40- to 60-in. wide-belt conveyors. Goodman Manufacturing Co., Chicago, Ill., displayed a G-20 shaker conveyor drive now being used on the Mesabi range and a number of metal mines in the West and Southwest. The new No. 5 diamond-core drill and the new CP-44 self-rotating stoper were exhibited by Chicago Pneumatic Tool Co., New York, N. Y. A complete line of pneumatic drills and auxiliaries and a display of "Jackbits" were shown by Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Other attractive displays of equipment and materials included those of Allen-Sherman Hoff Co.; Texaco Co.; Alloy Steel & Metals Co.; American Brattice Cloth Corp.; Anaconda Wire & Cable Co.; Bethlehem Steel Co.; Bucyrus-Erie Co.; Card Iron Works Co.; The Dorr Co., Inc.; E. I. du Pont de Nemours & Co., Inc.; Thomas A. Edison, Inc.; Eimco Corp.; Fiske Brothers Refining Co.; Hercules Powder Co., Macwhyte Co.; Jeffrey Manufacturing Co.; Marion Steam Shovel Co.; Merco Nordstrom Valve Co.; John A. Roebling's Sons Co.; SKF Industries, Inc.; Standard Oil Company of California; Stephens-Adamson Manufacturing Co.; Tamping Bag Co.; Union Wire Rope Corp.; Wood Shovel & Tool Co.; and others.

Regulator and Exciter Unit

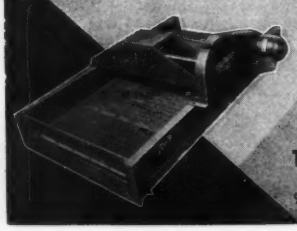
EFFICIENT quick-response regulation for automatically holding constant output on d.-c. and a.-c. machines is said to be available with the new "Regulex" exciter applied to mill drives and mine hoists developed by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. This rotating regulator reduces the first cost of a generator or motor installation because exciter and regulator are combined in one unit. The unit consists of a differential amplifier for controlling the excitation on d.-c. motors and generators to give



Above is shown the largest tapered roller bearing manufactured by the Timken Roller Bearing Co., Canton, Ohio. Four of these bearings having a 35½ in. bore by 51 in. outside diameter, 36 in. wide, are installed at the new hot mill of the Aluminum Company of America, Alcoa, Tenn. Each bearing weighs 9,070 lb. Individual rolls are 4 in. in diameter, 7¼ in. long, and weigh 23.37 lb.

THE Leahy HEAVY DUTY

No-Blind VIBRATING SCREEN with TRI-VIBE —for Fine Mesh Screening



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No Screen Frame Breakage
No Tearing up Screen Cloth along the Sides
No Power Waste

Operates at full capacity and efficiency with 1 H. P. motor

Write for Bulletin No. 14-H.

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constant voltage, current, speed or tension. This type of exciter is being developed for all sizes of d.-c. machines, and is applicable to a.-c. synchronous motors, generators, and condensers.

BULLETINS

Chisel Steel. Jessop Steel Co., Washington, Pa. Bulletin 641 describes the manufacturer's line of steels for use in making chisels. Pp. 8.

Revolving Feed Distributor. The Deister Concentrator Co., Ft. Wayne, Ind. Folder describes and illustrates features of the manufacturer's Type CRF Concenco Revolving Feed Distributor. Pp. 4.

Mine Pumps. Ingersoll-Rand Co., Cameron Pump Division, 11 Broadway, New York, N. Y. Bulletin 7071 is an attractive brochure describing and illustrating the manufacturer's single-stage, two-stage, and Class NT, RT, and HMT multi-stage centrifugal pumps. Single- and two-stage motor pumps are also described. Useful engineering data on pumps are also included. Pp. 23.

Paint. Skybryte Co., Cleveland, Ohio. Folder describes the manufacturer's marine black paint for metal and wood application. Pp. 4.

Conveyors. Pioneer Engineering Works, Minneapolis, Minn. Form 600 describes and illustrates features of the manufacturer's KD conveyors. Specifications for the various sizes of troughing, idlers, and winch-type belt tighteners are also included. Pp. 24.

Catechism of Electrical Machinery. Fairbanks-Morse & Co., 600 S. Michigan Ave., Chicago, Ill. Bulletin E-100-C is a useful and handy book describing electrical phenomena and terminology. The book explains electricity and magnetism as utilized in electric generators and motors and discusses important electrical measurements. Principles of direct-current generators and motors are presented, followed by examination of alternators and alternating-current motors. Pp. 48.

Unit Heaters. Carrier Corp., Syracuse, N. Y. Bulletin 46-15 describes the manufacturer's non-freeze unit heaters for use in industrial and commercial heating installations. Pp. 6.

Mechanical Meters. Brown Instrument Co., Philadelphia, Pa. Catalog 2204 describes the manufacturer's line of mechanical flow and liquid level meters for indicating and controlling. Pp. 16. **Furnace Pressure Controller.** Bulletin 74-2 tells how, when, where, and why the manufacturer's line of furnace pressure controllers can be used to maintain constant furnace pressure automatically. Pp. 8.

Cylinders. Galland-Henning Mfg. Co., Milwaukee, Wisc. Bulletin 82 describes the manufacturer's Nopak cylinders for various industrial uses. Pp. 11.

Portable Vulcanizer. The B. F. Goodrich Co., Akron, Ohio. The company has issued new catalog section on its Type RO portable vulcanizer for repairing the covers of conveyor belting. Pp. 1.

Angle Tool Attachments. Invincible Tool Co., Ft. Wayne, Ind. Bulletin describes manufacturer's line of unique tool attachments for operations in small spaces and corners. Pp. 8.

V-Belt. Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin 6190 describes the manufacturer's new Super-17 V-Belt. Pp. 8.

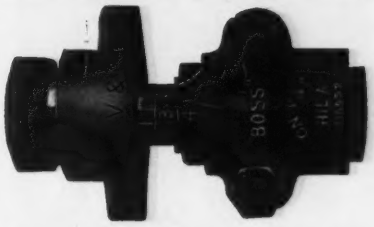
Portable Substations. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Folder F-8643 describes and illustrates the manufacturer's portable substations with ratings between 15 and 2,000 kva. for underground service. Pp. 4.

Vibrating Screen. Denver Equipment Co., Denver, Colo. Bulletin S3-Bs describes and illustrates features of the company's new Denver-Dillon vibrating screen. Pp. 4.

Thickners and Diaphragm Pumps. Morse Bros. Machinery Co., 2900 Broadway, Denver, Colo. Bulletin 4119 describes and illustrates the manufacturer's thickners and diaphragm pumps for belt or motor drive. Pp. 4.

Wire Rope for Mining. Broderick & Bascom Rope Co., St. Louis, Mo. The company announces the availability of its 1941 handbook describing applications and uses of various sizes of wire rope for the mining industry. Many pages of useful engineering information are included. Pp. 96.

"GJ-BOSS"
GROUND JOINT
AIR HOSE COUPLINGS



Compact Type, Style XLB-61, ½" and ¾"
Heavy Type, Style XHB-72, ¾" and 1"

Recognized as the strongest, safest and most dependable coupling for heavy duty mining and construction service. Ground joint, *washerless* construction. Furnished with strong, malleable iron "BOSS" Interlocking Clamp, with its powerful, evenly distributed grip. Cadmium plated—rustproof.

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- High Pay Load Capacity
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WRITE for complete information on recommended types for your service. Request Bulletin No. 71

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Reclaiming Muriate of Potash in Warehouse.

Mill near Arctic Circle Uses 3 Small Sauerman Scrapers for 80,000-Ton Storage of Ore.

At mines, mills and smelters, Sauerman Power Scrapers are being used most effectively in the stockpiling of both raw and processed materials, either in the open or inside buildings.

The first cost of a Sauerman installation is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of a single operator.

For illustrations and details of the many varied forms of Sauerman Power Scraper installations for storing and reclaiming, write for Catalog No. 15. If you are interested likewise in the use of scrapers and cableways for excavating, ask also for Catalog No. 19.

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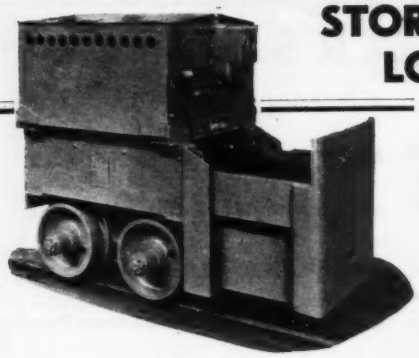
POWER SCRAPERS FOR STOCKPILING

. . . A LIGHT-WEIGHT UNIT THAT DOES A HEAVY-WEIGHT's JOB . . .

THE ATLAS TYPE "J" 1-½ ton STORAGE BATTERY LOCOMOTIVE



TYPE "J"

A low first cost unit because of modern production methods, the savings being passed on to you. Has a totally enclosed spur gear drive.

● **Weighing only 1½ tons, the ATLAS Type "J" storage battery locomotive meets all metal mining conditions. Intended for light tramming service, it more than handles its specified job . . . in fact, give it *any* job in its weight range, and note the excellent service that will bring you savings. Combining low upkeep with high operating efficiency, the Type "J" is ideally suited for both large and small operations. Give it a trial—a letter to us today will bring details by return mail—Write!**

THE ATLAS CAR & MFG. CO.

ENGINEERS — MANUFACTURERS

CLEVELAND OHIO

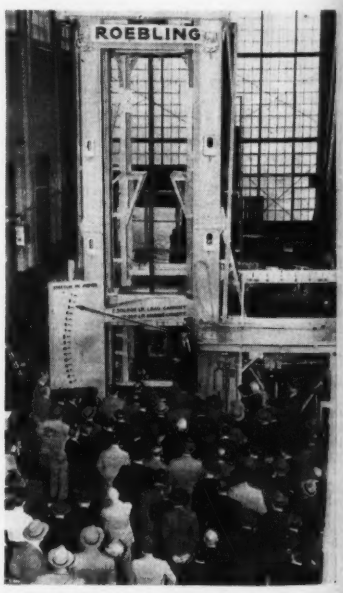
INDUSTRIAL NOTES

Howard I. Young, president of American Zinc, Lead & Smelting Co., announces the appointment by his company of **American Cyanamid Company,** 30 Rockefeller Plaza, New York, N. Y., as sales and technical representatives throughout the world for **Heavy Media Separation** (sink-float) processes formerly offered to the mining industry by American Zinc, Lead & Smelting Co. as the MBI patented sink-and-float process.

The 100th Anniversary of the founding of The John A. Roebling's Sons Co. was appropriately celebrated during the middle of September, at Trenton, N. J. The company, well known in the mining industry, where its large and small wire ropes and other wire products are used, was started in 1841. In 1837 John A. Roebling, an engineer, became associated with the builders of the Pennsylvania Canal, where he witnessed barges transported across mountains by means of portage railways, that employed 9-in. diameter hemp hawsers for the work.

About this same time, Roebling saw an engineering paper describing experiments in the fabrication of rope out of wire. He began to experiment in 1840 at his farm in Saxonburg, Pa., and after being treated coolly, like so many men with new ideas, he finally sold his first wire rope in 1841 to the Pennsylvania State Board of Water Works. The rope lived up to every promise he had made; it weighed no more than the huge hemp cables; its diameter of 1¼ in. made it convenient to work with; and it long outlasted the hemp. John A. Roebling's effort had assured the acceptance of wire rope as a new engineering material.

Today, the Roebling organization has 417 acres of plant space accommodating 258 buildings, with a payroll of over 6,200 persons.



Breaking a 4-in. steel cable in a test at the Roebling plant. The wire broke at 1,400,000 lb. and stretched eleven inches before breaking